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HOW TO MAKE AND HOW TO MEND

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HOW TO MAKE

AND

HOW TO MEND

BY

AN AMATEUR MECHANIC

NEW YORK: THE MACMILLAN COMPANY
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PUBLISHER'S NOTE.

An Appendix is added to this edition, thereby bringing it up to date in regard to matters of considerable importance.

The extra matter necessarily encroaches on the province of the expert, but the information given will be useful in preventing an awkward difficulty becoming a serious disadvantage.

The few extra hints will, it is hoped, increase the value of the work, by furnishing particulars that will frequently save time, money, and annoyance.

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HOW TO MAKE AND HOW TO MEND.

AEOLIAN HARP. Make a box of very thin pine, cedar or other soft wood, 5 to 6 in. deep × 7 to 8 in. wide, and as long as the window in which it is to be placed is broad. Glue two strips of wood across the top, one near each end, ½ in. high × ¼ in. thick, for bridges. Into each end of the box insert wooden pins, similar to those used for violins, and where they enter glue a piece of wood on the inside of the box to give strength. Cut a sounding hole in the middle of the top. Fasten one end of each string to a metallic pin in one end of the box and carry it over both bridges, fastening the other end to a wooden pin in the other end of the box, and tighten up. The strings should be small catgut or blue E violin strings. Tune all the strings in unison, and place the harp in the window.

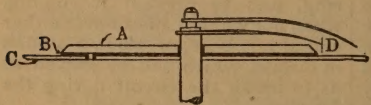
Four-stringed harps are most satisfactory, but a fewer number of strings can be used.

ALARM: BURGLAR. (1) Make a finely-tapered wedge of hard wood or metal, and attach a small plate of metal loosely to one side. Insert a percussion-cap between the wedge and the metal plate attached, and place it under the door from the inside. To prevent the wedge from slipping along the floor, drill a hole in the floor close behind it and insert a movable stop. When the door is opened the cap will explode. (2) Attach two light strips of brass to the beading over the door; they should overlap, but not touch each other at any point, excepting when the door is opened, and then the lower strip should be pressed against the upper one. Attach one end of a wire to one of the brass strips, and the other end to one terminal of a continuous ringing electric bell. Attach one end of another piece of wire to the other brass strip, and the other end to one terminal of an electric cell. Connect the remaining terminals of the bell and cell together with a third wire. When the door is opened the bell will ring, and to prevent it ringing, when not wanted, disconnect either end of any wire, or place a switch in circuit, which can be moved so as to break the circuit during the daytime.

ALARM CLOCK. Bore a hole in the side near the hammer of a common weight-clock. At a convenient distance under this bore two more holes, one in each side, so that a string stretched between them will run under the time weight. Connect a piece of string to the wire that makes the clock strike in regulating, pass it out of the top hole, through the two underneath, and secure the other end. The time weight in descending will press on the string, and will make the clock strike until the whole weight runs down. To set, see how far the weight travels in an hour, and then set the weight the proper distance up.

ALARM CLOCK: ELECTRIC. (1) A piece of brass A is turned to fit on the dial of a clock C, and is fixed on with marine glue B, which serves for insulation. Small holes are bored in A, and a piece of fine platinum wire, which fits tightly in any of them, projects when placed in them, so that it just touches the

hour-hand D when it is over it. Connect one wire to A, being careful to keep it insulated from the rest of the clock, and connect the other wire electrically to D by joining it to the metal framework of the clock. Connect the free ends of the wires to a cell and bell in the ordinary way. A switch may be placed in circuit to prevent the bell from ringing when not required. When the hour-hand passes over and touches the projecting platinum wire the bell circuit is completed, and the bell rings. To alter the time at which the alarm is to ring, place the platinum wire in the hole in A, which is most nearly opposite



the required hour, and then bend the platinum wire so as to make contact at the exact time.

(2) Drill a hole through the side of the clock between the glass and the dial, and opposite the time it is required for the alarm to ring. Insert a piece of wood through the hole, and drive a pin through, so that it makes contact with the hour hand, when the hour hand passes by. Connect one wire to the head of the pin, and another wire to the metal frame-work of the clock. Connect up the free ends of the wires with the cell, bell and switch in the usual way.

ALLOYS.

Alloy.	Tin.	Copper.	Zinc.	Antimony.
Bearings, white-metal for	67	22	—	11
Bell	1	4	—	—
Brass	7	64	1	—
Britannia-Metal .	81	1	2	16
Pewter . . .	100	—	—	17

[*See also* SOLDER]

AMBER. *How to Repair:* Warm the broken pieces, dampen them with caustic potash, and then press them tightly together. [*See also* CEMENT (AMBER)]

How to Test: Pure amber remains unchanged by the application of ether; but imitation amber is softened by it.

ANNEALING. *Copper and its Alloys:* To anneal copper and its alloys, heat it to a red heat, and plunge it into cold water.

Iron and Steel: To anneal wrought iron, mild or tool steel: (1) Place the metal in a slow wood fire, and leave it to cool down in the ashes as the fire dies down. (2) Heat to a cherry red, and then surround the metal with non-resinous wood in a metal box, and close the lid. To anneal cast iron, keep it at a good red heat for twenty-four to forty-eight hours. To anneal cast steel, keep it at a good red heat for twenty-four hours.

APHIS: HOW TO REMOVE. (1) Mix 1 lb. soft soap with 10 gals. soft water, and apply with a syringe, using the finest spray nozzle. (2) Mix 1 peck soot and 1 qt. quick lime in 3 gals. soft water; stir it well, and then leave it for twenty-four hours. When the soot rises to the surface, skim it off. Apply the wash with a syringe. (3) Steep 1 lb. coarse shag in 6 gals. hot water, and mix in 8 oz. soft soap; apply with the finest spray nozzle. Syringe the leaves with clean water twelve hours later.

AQUARIUM. A convenient size is 24 in. long × 12 in. high × 12 in. broad. Mark out a board 26½ in. long × 14½ in. broad × 1½ in. thick for the bottom. Cut two pieces of glass 23½ in. × 12 in. for the back and front, and two pieces 11½ in. × 12 in. for the sides. Cut four pieces of wood 1¼ in. × 1¼ in. × 14 in. long for the corner

uprights; and on each of two adjacent sides of each upright cut grooves 1¼ in. deep, and a little thicker than the glass, with a saw and chisel. Fit the glass in the grooves, and then place all in the correct position on the bottom board. Now mark on the bottom board round the base of each corner upright, and remove the frame. Bore a 1 in. hole through the centre of each of these four marks; and cut the uprights to drive tightly in with square shoulders, and to project ⅛ in. below the bottom board. Now remove them, and saw slots in the rounded ends of the uprights nearly up to the shoulders. Dip this end of each upright into white lead paint, and paint the inside of the holes in the bottom board. Now drive the uprights into their respective holes with the saw-cuts across the grain of the bottom board, and drive wedges into the cuts. When dry saw all off flush. Now slip the glass into the grooves, and cut the tops of the uprights off level with the top edges of the glass. To make the aquarium stronger, cap pieces may be run from upright to upright over the top of the glass, mitred together at the corners, and held down with screws driven into the top of the uprights. Heat some aquarium cement [*see* CEMENT (AQUARIUM: No. 2)], but not to boiling point, or it will crack the glass, and pour it down one junction of glass and wood. Leave it in that position for two or three minutes till it has set, and then repeat on all the other joints of glass and wood. Coat the bottom with cement. [*See* CEMENT (AQUARIUM: No. 1).] Strew the bottom with sand 1½ to 2 in. deep, and then with a thin layer of gravel. For rock-work cut pumice-stone to the required shapes and sizes. If amphibians are to be kept, the rock-work must project above the water, or a piece of wood or cork left floating on the surface of the water. First introduce the water-plants, which must have good roots. Cover the outside of a flower-pot saucer with cement, and press pebbles and stones into it while soft. Fill it with clean, yellow loam, and plant the water plants in it. Then cover the loam over with pebbles to prevent the fish stirring up the mud, and place it in the water. A week or so later introduce two or three water-snails, which act as scavengers. Three or four days after this the fish may be put in. Keep one gold fish or roach, or two minnows to every 1½ gals. of water. The aquarium described would accomodate eight gold fish or sixteen minnows. Gold fish, carp tench, roach, rudd, gudgeon, eels, minnows, and sometimes small jack (pickerels) thrive well in deao water, but on no account must the fish be overcrowded. Trout grayling, and in most cases dace, require a continuous supply of water running over a gravelly bottom. Avoid a supply from a lead pipe, unless the supply be continuous. The water must be aërated at least once a day with a syringe, if the water be dead, and completely changed every two months. Every six months the pebbles should be cleaned with sand and salt. It is best, however, to have a continuous supply entering at the bottom, and draining near the top of the tank, or entering by a small fountain, or even only drop by drop. If the light be too strong the fish will go blind; and, if too feeble, the vegetation will decay. The light should fall from above only. To feed the fish, suspend raw beef in the water by a thread; give a few worms occasionally, but dead worms must be removed

immediately; ants' eggs are also good food. Farinaceous foods, such as bread, should never be given, as they make the water sour. Roach, rudd and snails feed on the weedy growth on the glass.

ARROWS. Split out the stick from greenheart, or some similar wood; the length to suit the size of the bow. 2 in. should project, when the bow is fully drawn, and all the arrows for one bow should be of the same length. Plane up two sides perfectly parallel; with a straight edge mark off on one planed side two parallel lines equal to the thickness between the planed surfaces. Plane up to these marks, keeping the stick square. Now work the corners off, and plane down till round. The string notch is cut with a sharp knife in the centre of one end. To head, saw a slit opposite the notched end, and insert the arrow head, which is held in place by binding with well-waxed thread. To feather, soak turkey quills in warm water till they split uniformly; then strip the feather from the quill, and glue three equidistantly around the shaft. The large end of the feather is fastened near the notch. Sometimes the feathers are placed spirally on the shaft, a twist of $\frac{1}{8}$ in. being usually considered sufficient. This gives the arrow a rotatory motion. A bolt for a cross-bow is similarly made, but is not more than 12 to 15 in. long. The bolt should fit the groove of the gun exactly.

ASH-SIFTER. Bore two $\frac{3}{4}$ in. holes in an old flour barrel 8 in. from the top and 8 in. apart; and then bore two more holes opposite these. Drive in two broom handles parallel to each other through these holes. Cut out a piece of the stave on one side over the two holes—for the sieve handle to come through. Rest the sieve on the two broom handles with the handle projecting through the hole just made, fit a board over the top for a cover, and the sifter is complete.

AXE: HOW TO HANG. Set the head, so that a straight edge running along the upper side of the shaft, at the point where the little finger comes, will cut the centre of the rounded or cutting edge of the blade; also, so that by sighting along the side of the shaft, the head will be in an exact line with the whole length of the shaft. For rasping and fitting in the wedges *see* HAMMER.

AXLETREE: HOW TO REPAIR. If the axletree arm be broken off at the hub, remove the load from the waggon, and block up the axletree a few inches higher at the broken end than at the other; then procure a piece of tough rail or young tree, dress off one end tapering for an axle arm, so that it will fit into the hub of the wheel that is off, and lash the piece to the broken axletree with rope or wire. If rope be used, after it has been drawn up as tight as possible, drive in a few wedges under it and then wet it. The wheel may now be put on, and if there be no auger to drive a hole to fit the linch-pin in, drive a nail through, and then wind a piece of twine round till a ridge is formed sufficiently high to prevent the wheel from working off. If the axletree break near the middle, lash a rail which should extend from wheel to wheel, underneath it, and bind the rail on at both ends, and on each side of the fracture. If the wheel give way, a temporary runner made of a plank fitted beneath the hub will run for miles.

BAG FRAME. In the upper wall of the granary drive a couple

of staples 4 to 6 ft. apart, and to these attach strong fine wires long enough to come down within handy reach. To the lower ends of the wires suspend a rake handle or similar rod, over which the bags are hung.

BAG HOLDER. (1) Cut a piece of plank about 20 in. long × 12 in. wide; bevel off the ends slightly, and nail strips of thin boards 6 to 8 in. wide to them for uprights, as shown in the illustration. The base should bevel to such an extent that the uprights are about 15 in. apart at the top. The bag is rested on the bottom between the uprights, and the top of the bag is folded back over them about 2 in. (2) Two hooks driven into a wall may be used to suspend the sack from.

BALL: WOOLLEN. Cut two circles of pasteboard as shown in the illustration. Place a long thread of wool in a darning needle, hold one circle on the top of the other, and pass the threaded needle through the hole in the

centre, and then over and under, until the hole is completely filled. The tighter the wool can be crowded in without breaking the pasteboard the better. Cut the wool all round the outside edge with a pair of scissors. Slip a piece of strong thread or twine between the two circles of pasteboard, and tie, so as to nip all the lengths of wool in the middle; then tear the pasteboards, and remove them. Trim all over to make smooth, if necessary. If a crocheted chain be used instead of the twine, and left long, these balls make neat tassels.

BALLOON: PAPER. Cut 8 pieces of tissue paper 36 in. long × 10 in. wide at the widest part, which is 15 in. below the top, and 5 in. wide at the bottom, as shown in Fig. 1. Paste the edges of these together, leaving the bottom free. If the points do not come together at the top,

FIG. 1.

cut a circle of tissue paper about 5 in. diameter and paste it over the top. Around the bottom, which will be open 12 in. or more, put a light stick hoop. A small willow stick peeled, bent and dried will answer, but it must be very light. To fasten, paste the edges of the strips around it. Now cross two

wires the thickness of cotton thread over the mouth and fasten. Take a piece of cotton-wool the size of a walnut, and wrap it round the cross made by the wires.

To send the balloon up, draw it sharply through the air to fill it out; saturate the cotton wool with methylated spirits; hold a fruit can with both ends knocked out

FIG. 2.

over the cotton wool and then light it, some one else holding the balloon upright all the time. When the balloon begins to sway, take away the fruit can, and let go.

A balloon made of newspaper must be at least twice the size given for the tissue balloon, or 6 ft. high.

BAMBOO: HOW TO BEND. Hold one end of the bamboo loosely in a vice, and pull with a slight pressure in the direction the bend is to be. Then run a lighted Bunsen burner, or a spirit lamp, along the wood, twisting the wood round, and moving the flame continually. When the bamboo is sufficiently hot it will be felt to give as it is pulled. Keep on heating and bending, but be careful not to burn the wood, till it is bent as desired; then wrap in wet flannel till cold. A mottled appearance may be given by singeing, but not burning the hard outer skin.

BAROMETER. (1) Dissolve 2 parts camphor, 1 part saltpetre, and 1 part sal-ammoniac, in strong spirits of wine; and then add water till the camphor is partially precipitated. Take a tube, sealed at one end, 10 in. long × 1 in. diameter, and pour this solution in. The top end may be left open or sealed as desired The tube is fixed horizontally against a wall. (*a*) If the weather is going to be fine, the precipitate will remain entirely at the bottom of the tube, the liquid above being transparent; (*b*) If the weather is going to be wet, the precipitate will slowly rise, and crystallisations like stars will be seen; (*c*) If the weather is going to be stormy, the precipitate will rise to the top, crystallising like a leaf, and the liquid will seem to effervesce; (*d*) The crystals form chiefly on the side from which the wind will blow; (*e*) In winter the precipitate will be higher in the tube. Cold weather is indicated by crystallisation like needles.

(2) Cut two sheets of pasteboard, about 2 ft. × 3 ft.; bring the two ends together, and glue them together tight, so that two pipes are formed, each 2 ft. long × about 11½ in. diameter. Cut thin round boards exactly to fit in the ends of these cardboard cylinders. Tack the heads in place with thread, and glue them air-tight. Take a very light rod, about 6 ft. long, and fasten one drum to each end. Balance this pole with a drum on each end by a pivot in the middle. Bore a gimlet-hole through the end of one drum. The inside of one drum communicates through the gimlet-hole with the outside air, but the other drum is air-tight. If the surrounding air gets heavier, the air-tight drum will rise, and *vice versâ*.

(3) Fill a large-mouth pickle jar with water; remove the straw covering and thoroughly clean a Florence oil flask, and plunge it neck down into the water in the

pickle jar as far as it will go. In fine weather the water will rise up the neck of the flask; in rainy weather it will fall.

BARRELS: HOW TO CHAR. Take out the head of the barrel, place the body over a brisk fire, and char the inside completely; then replace the head. Before use, fill the barrel two or three times with hot liquor, and thoroughly shake.

BARRELS: HOW TO CLEAN. (1) Half-fill the barrel with water. Dissolve 2 lb. soda in as little water as possible, and pour it into the barrel. Thoroughly rinse by shaking the barrel, and then fill up to the top with more water. Leave this liquid in the barrel for about a fortnight; then draw off, rinse, and fill up with clean soft water, and leave for a few days. (2) Put in 4 qts. to 1 peck charcoal, and a cupful of saleratus; and fill up with boiling water. Cover the barrel, and let the liquid remain in it till it becomes cold; then rinse thoroughly. (3) Rinse with a fairly strong solution of oil of vitriol and water. (4) Scour the inside with sand and water, and afterwards apply a quantity of charcoal dust. (5) Dissolve as much salt as possible in boiling water; fill the bottom of the barrel with lime; pour in the boiling salt water and shake well. Open barrels or tubs should be covered with a board to keep the steam in. [*See also* BARRELS (MUSTY)]

BARRELS: HOW TO DRY. To prevent the hoops falling off butter barrels, soak the barrel in glycerine till it is thoroughly impregnated.

BARRELS: HOW TO HOOP. Punch a hole about ½ in. from one end of a piece of 1 or 1¼ in. hoop iron. Bend the iron round the cask a little higher up than where it is to go on, and mark where the first hole comes on the iron underneath. Punch a second hole at this mark; cut the iron ½ in. away from it and rivet up.

BARRELS: MUSTY. (1) Burn sulphur in the empty cask, and leave for a few days. (2) Place live coals in the barrel, and fill up with boiling water. Roll the cask once or twice a day for a week; then wash out with cold water, and expose to the air for some days.

BARRELS: PRESS FOR. Drive a staple in the floor, and attach a chain to it a little longer than the barrel. Take a board 8 ft. × 4 in. × 4 in.; make a loop in the chain, and insert one end of the board. Place the barrel close up against the staple, and apply a weight to the other end of the lever. As the goods in the barrel sink, place boards under the barrel so as to lift it up.

BARRELS: WINE AND CIDER. For a new barrel use 1 lb. alum and 4 to 5 lb. salt to 4 bucketfuls of water. Heat to boiling, and pour a bucketful at a time into the cask; rinse thoroughly, and let it stand an hour, and then turn it out. Repeat till the 4 bucketfuls have been used. Finally rinse with cold water, and fumigate with sulphur as in BARRELS (MUSTY: No. 1).

BASKET: CORAL. Make a wire basket as for BASKET (WIRE WALL), but the wire must be covered with cotton. Cover the basket all over with knots about 1 in. apart. Melt ½ lb. beeswax in a shallow pan, and stir in Japanese vermilion till coral coloured. Roll the basket in this liquid wax until it is completely covered, and hang it up to dry.

BASKET: CRYSTAL. *Blue:* Make a saturated solution of blue vitriol, and place a basket made from copper wire in it, till the wire is sufficiently coated. This

basket cannot be washed, for the crystals will dissolve in water. *Red:* Make a saturated solution of red prussiate of potassa, and immerse as for blue. *Yellow:* Make a saturated solution of cyanuret of potassium, and immerse as for blue. *White:* Make a saturated solution of alum, and immerse as for blue.

BASKET, HANGING: COCOA-NUT. Cut off one-third of the small end of a cocoa-nut, and clean the inside. Drill three holes near the edge for cords to suspend by.

BASKET, HANGING: GLASS. Break off the stem of a broken wine glass near the bowl. Crochet an open work bag with or without a tassel at the bottom for the bowl, and suspend by cords.

BASKET, HANGING: HOW TO FILL. Fill the interstices with the moss found growing on tree stumps. Place an old sponge in the bottom; cover with muslin, and fill up the basket with rich soil. A sprinkling of pure bone dust over the mould once a month is a splendid manure. If a showy centre plant be desired, place it in a flower pot, and then place the pot in the hanging bowl, covering it over with rich hotbed soil. The basket should be taken down, and placed in a tub of water deep enough to cover the soil once a day.

BASKET, HANGING: IVY. Use a wooden bowl, and suspend by three brass chains. Smear the inside with tar, and place a sponge in the bottom to retain moisture. Fill up with earth, and start the ivy with cuttings, simply inserting them in the soil.

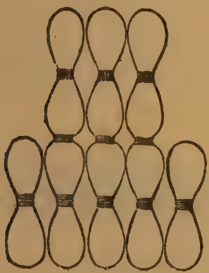
BASKET, HANGING: RUSTIC. Choose sticks of oak about the size of a man's thumb. Cut 14 lengths, 8, 10 or 12 in. long according to the size of basket desired. Fasten together, as shown in the illustration, by thrusting a red-hot wire through the sticks where they cross, and

leave loops in the wire at the top to suspend by. For filling with earth *see* BASKET (HANGING: HOW TO FILL).

BASKET, HANGING: SHELL. Cup-shaped sea-shells, suspended by brass wire passed through holes drilled near the edge, make good baskets for mosses and similar plants.

BASKET, HANGING: WIRE. Cut 32 lengths of stiff copper wire about 21 in. long; bend each length as a figure 8, then bind or solder up firmly. Each section should then be about 7½ in. long. Cut 8 pieces of the same wire 14 in. long, and make up in the same shape; these sections should then be about 4½ in. long. Use 8 sections for the front, 8 sections for the back, 3 sections on each side and 8 of the shorter sections for the bottom. Use 8 large sections for the handle, and fix them together as shown in the illustra

tion. Attach it to the top edge of the basket in the centre; and then for a support to the front, tie the ends of 2 sections together, and attach them to the centre section



of the front, and to the centre of the middle upper section. Hoop iron may be soldered or bound along the centres of the sections all the way round to stiffen.

BASKET, HANGING: WOODEN. Ornament an old wooden bowl with small roots, twigs split down the middle, acorns or scales of long pine cones. Attach these with small brads or with waterproof glue [*see* GLUE (MARINE)], and finish with two coatings of carriage varnish. Bore several holes in the bottom, and when filling up the bowl with earth, cover them on the inside with broken pieces of flower-pots. Suspend by three strong brass wires. Instead of a bowl a keg or butter firkin sawn in half may be used. Ornament as before, and paint the inside with tar.

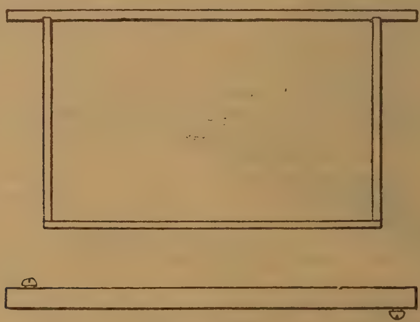
BASKET: WIRE WALL. Cut 23 wires into pieces about 20 in. long, and make sections as shown in the illustration, lapping the ends together for ½ in. and fastening with stout thread, or better, with solder. Take 4 of these loops for the bottom; place them side by side, and fasten firmly. For the back and front take 4 loops, and fasten them to the bottom; then 3 loops, and fasten them to the 4 loops; then 2 loops, and lastly 1 loop. For

the sides take 1 loop and fasten it to the bottom and the back and front. Fix another loop between the back and front near the top for a handle.

BEDS: FEATHER. If feathers work through the tick, empty them out, and turn the tick inside out. With a piece of beeswax slightly warmed rub the tick all over on the inside. Replace the feathers, and sew up.

BEE-HIVE: TEN BAR FRAME. The standard brood frame is 14 in. × 8½ in. outside measurements, as shown in Fig. 1. Make the top from yellow deal 17 in. × ⅜ in. × ⅞ in., so that 1½ in. projects over each side. Make the sides 8⅛ in. × ¼ in. × ⅞ in., fitting them ⅛ in. into the top, as shown. Make the bottom 14 in. × ¼ in. × ⅞ in., and nail all together with sharp brads. Then screw into the top two small screws, as shown in Fig. 2, which is a plan or view obtained when looking on the top of a frame. These screws should project just so far that the frames, when hung in position in the hive, are kept 1½ in. apart, centre to centre. This last dimen-

sion, 1½ in., is that most commonly used, though 1·45 in. is also used. These frames should be firmly held together and neatly made. They can be bought ready made for little more than the bare cost of the wood. The body of the frame is made from ⅜ in. yellow deal, which must be clean and free from knots and shakes. It is made in four sections as shown in Figs. 3 and 4. Round the bottom of each section a fillet is nailed on to slip over the top of the section below, so that, if required, the second or third section may be taken out during the winter. If time can be spared, all the joints of each section should be tongued and grooved, but in any case a tongue joint should be made between the floor and the bottom of the first section. Cut the wood to make the bottom section 17 in. wide × 18 in. deep inside, and then fit on the floor, leaving a gap of 2 in. in front, as shown in Fig. 4. Then nail on a piece of wood 1 in. × ⅜ in. all round the edge on the underneath side of the floor to raise the hive slightly, and slant off the front edge, and nail a piece across the top for a flight board. The bees will enter by crawling up the flight board and under the gap left between the front and the floor. Now nail on to the floor two pieces of wood 8½ in. high, running parallel to, and 1¼ in. away from, the sides, so that the sides are double walled, and the inside measurement is 14½ in. × 17 in. deep as shown in Fig. 3. Cut the top edge of the inner walls to a peak, and nail thin zinc plate on, as indicated by a thick line in Fig. 3. These inner walls support ten frames side by side, as is clearly shown in Figs. 3 and 4. The zinc plate is nailed on to the top edge to enable the frames to be removed, for if the wood of the inner walls were left square on the top, and not covered with metal, the bees would cement the frames down on to them with wax. Fill up the space between the two inner and outer side walls with cork dust, hair or sawdust, and lay a close-fitting thin strip of wood over the top, to prevent the bees entering between the double walls. The second section is made in exactly the same way, only the frames here are only 5½ in. deep instead of 8½ in. deep. They are also best hung at right angles to those below. The inside dimensions



FIGS. 1 AND 2.

of this section are 6 in. × 17 in. × 18 in. The inner walls are here placed parallel to the back and front, and are 1¼ in. away from them, so that the inside dimensions are 14½ in. × 17 in., as below. Fill up between the double walls with cork dust, hair or sawdust, and cover it over with thin strips of wood, as in the first section. A fillet 2 in. × ¾ in. is nailed on to the bottom, letting 1 in. overlap all round, so that this all. These supers are usually supported by thin metal bent to the shape of an inverted "T," which rest on the top of the shallow frames. Sometimes a very light inner frame is made, in which the supers are arranged. At one end of this frame there is a false back, which is pressed forward by a spring. By this means all the supers are pressed together, and the honey distributed equally in each. A thin sheet of zinc, wood

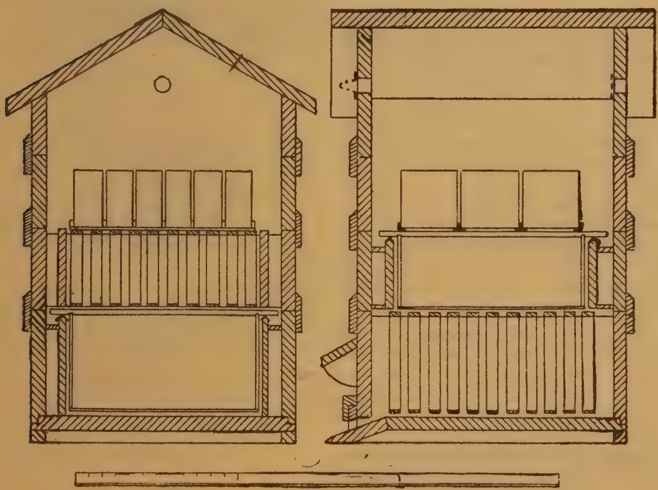


FIG. 3. *Scale.* FIG. 4.

section can be easily dropped on to the first, but it should make a good joint and be free from draughts inside. The third section is made without double walls 17 in. × 18 in. inside, and contains the supers. The ordinary super is 2 in. × 4¼ in. × 4¼ in., which is sold commercially as containing 1 lb. honey. Six rows of three supers abreast are arranged as shown in Figs. 3 and 4, making eighteen supers in or cardboard should in any case be placed between each row of three supers, or else the supers may become cemented together, or bulged outwards. A large flat thin sheet of zinc should also rest on the top of each series of frames with about ¼ in. to ⅜ in. clearance all the way round the edge for a beeway. The fourth and last section carries the roof. The roof rises 5 in. in the centre, and should project about 2 in. all

round for leaves. A good mitre joint should be made at the top, and then zinc bent and nailed over it on the outside to keep out all wet, as indicated by the thick line. The roof is often covered with felt and then tarred. This is not necessary, but it makes the hive warmer in the winter. At each end of this section bore a 1 in. hole, and cover the one at the back with perforated zinc on the inside; over the front one nail a cone escapement, which allows the bees to escape readily from the hive, but they are very unlikely to find their way back again by it. During summer the opening at the top of the flight board, which serves as the entrance, may be left entirely open, but in winter this would be too draughty and cold. A sliding door should therefore be fitted, which can be opened more or less at will. This is shown in section in Fig. 4. A piece of wood like an inverted "L" is nailed on to the front just over the entrance. Two strips of wood can then be slipped into the groove thus formed, resting on the flight board, and if pressed together, the entrance would be entirely closed. This, however, is never desirable, so the bottom corner of each should be cut off, allowing, even when the two pieces of wood touch, an opening sufficient for two or three bees to come out at once. When the sliding doors are opened wide, the opening should be 6 in. × $\frac{1}{2}$ in., or 9 in. × $\frac{3}{8}$ in. These sliding doors and the guide should be made from some hard wood, which will not warp. Over the door a piece of wood like a lean-to roof is supported on brackets as shown in Fig. 4 to keep the rain off the flight board in wet weather, and to protect the door.

BELL: ELECTRIC. (1) To make a $2\frac{1}{2}$ in. electric bell. For the magnet core cut a piece of best $\frac{3}{8}$ in. wrought iron bar (A Fig. 1) 4 in. long, and bend it U-shaped, so that the two straight legs are about $1\frac{3}{4}$ in. long, and $\frac{5}{8}$ in. apart; that is, 1 in. apart centre to centre. Then soften it [*see* ANNEALING (*Iron and Steel*)], rub off the scale with emery cloth, and file up the ends square and level with each other. For bobbins (B) cut a strip of tough paper $1\frac{3}{8}$ in. wide, and bind it round a wooden mandril $\frac{3}{8}$ in. diameter. Wind on three layers of paper, and glue these layers

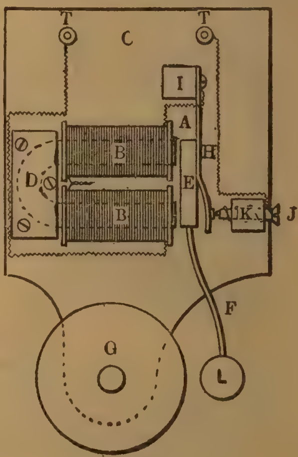


FIG. 1.

together as they are wound on, but do not glue the paper to the mandril; then bind the paper round with string till the glue is dry. Make another paper tube in the same way. Cut four discs of wood about $\frac{1}{16}$ in. thick, and barely 1 in. diameter, and drill $\frac{7}{16}$ in. holes through the centres, so that they are a tight fit on the paper tubes. Glue one of these discs on to each end of each tube for flanges. When dry, give the bobbins two coats of shellac or

sealing-wax varnish. The bobbins being still on the wooden mandril, and the varnish perfectly dry, wind 2 oz. No. 26 B.W.G. silk covered wire on each. Care should be taken to wind each layer flat and even, and to give a coat of Brunswick black, or shellac varnish over each layer, before winding on the next. Leave 6 in. of wire loose at each end for connections. Now slip the bobbins off the mandril, and slip one on to each leg of the magnet core, leaving $\frac{1}{16}$ in. of each leg projecting. The bobbins should be so put on, that when looking on the ends, one bobbin is wound with the winding "clockwise," and the other with the winding "counter-clockwise". To test if the bobbins are put on in this way, bare all four ends of the wires, scrape them bright, and twist the two ends near the bend of the magnet core together. Now connect a cell on to the two free ends, and test if it forms a powerful magnet. If not slip off *one* bobbin, reverse it, so that the ends of the bobbin change places, and twist together the ends near the bend of the magnet core as before. The magnet should now be strong, and if it be so, solder together the ends twisted together as shown. If the magnet still be weak, the wire has most probably been broken, and it will have to be unwound from the bobbins till the fault is found. This fault must then be repaired by soldering the two ends together. Cut out a base-board (C), the shape being immaterial, about 7 in. long × $4\frac{1}{4}$ in. broad to fix the whole on to. Cut out two pieces of wood (D), $1\frac{5}{8}$ in. × $\frac{7}{8}$ in. × $\frac{1}{2}$ in., and cut a semicircular slot $\frac{3}{16}$ in. deep × $\frac{3}{8}$ in. broad in each for the bend of the magnet core to bed in. Glue one piece on to the base-board, and when it is dry, place the magnet core in the slot, and screw the other piece down on the top. This will hold the magnet and bobbins in place. For the armature cut a piece of wrought iron (E), $1\frac{3}{8}$ in. × $\frac{1}{4}$ in. × $\frac{3}{16}$ in., and file it up square. Drill a $\frac{1}{16}$ in. hole down the centre of one end, and tap it. This hole is to receive the hammer shaft (F). Cut a piece of spring (H), such as the mainspring of an American clock, $2\frac{3}{4}$ in. long, and bend it as shown. Cut $\frac{1}{8}$ in. platinum wire, and hammer it out thin till it is about $\frac{1}{8}$ in. square. Solder this across the spring $\frac{1}{4}$ in. from the end, to make contact

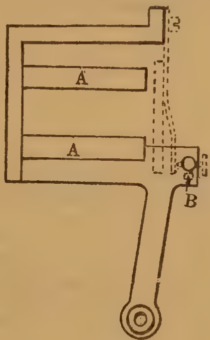


Fig. 2.

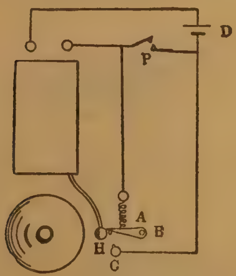
with the contact screw (J). At the other end of the spring drill two $\frac{1}{8}$ in. holes $\frac{1}{4}$ in. apart to fix on to the wooden piece (I), and solder or rivet the armature to the spring as shown. The spring, when bent down, should be about level with or a trifle longer than the end of the armature. Cut a piece of wood (I) $\frac{3}{4}$ in. × $\frac{1}{2}$ in. × $\frac{1}{2}$ in. Hold the armature opposite the ends of the magnet core, but $\frac{3}{16}$ to $\frac{1}{8}$ in. away, and glue this piece of wood, so that two $\frac{1}{2}$ in. screws can be screwed into it through the two small holes in the end of the spring without shifting

the armature. When dry, drive in these two screws to hold the spring and armature in place. To make the contact screw (J), file the end of a 1 in. brass wood screw flat, and drill a small hole down the middle. Cut $\frac{1}{8}$ in. platinum wire, tin it, and sweat it into this hole, and then file the platinum almost flush with the end of the screw. Drill a small hole $\frac{1}{2}$ in. from the bottom of another piece of wood (K), made the same size as (I), to screw the contact screw through, and let the screw only just project beyond the wood. Now place this block, so that the platinum tip of the screw just touches the platinum soldered on to the spring, and glue it down. Screw two terminals (T), on to the top of the board, and connect the wire from one bobbin to one of them. Slack out one of the two screws a little, which holds the spring and armature in place, twist the loose end of wire from the other bobbin round it, and screw it up tightly. Now take up an odd piece of wire, bare and clean the ends, and connect one end to the free terminal. Take out the platinum-tipped contact screw, slip the other end of this wire down the hole, and drive the screw in again. The connections are clearly shown in the illustration. Connect up two Leclanché cells across the terminals, and slowly screw in the contact screw, jarring the bell from time to time. When the armature begins to buzz by simply connecting the cell, the bell is properly adjusted. It should be remembered that the longer the stroke of the armature, the louder the bell will ring. The gong (G) is fixed to the base-board by any convenient method. The hammer head (L) is screwed on to a piece of No. 12 B.W.G. brass wire (F), the other end of which is screwed into the hole in the armature made to receive it. The shaft is then bent, so that the hammer head just strikes the bell when the armature is nearly touching the magnet core. To keep out dust, cover over all except the gong, half the hammer shaft and the terminals, with a box made from fretwood or an old cigar box. A longish slot must of course be left in this box to allow the hammer to vibrate. If there be a clicking sound when the bell rings, varnish a piece of paper and fix it over the ends of the magnet core.

(2) The framework of the bell usually sold is illustrated in Fig. 2. It is made entirely of cast iron with the exception of the two spindles (A) and (A), which are turned from soft wrought iron and screwed and riveted into the casting. These form the magnet core, and receive the bobbins. The armature and contact screw are shown by dotted lines; the small screw (B) being merely a binding screw to clamp the contact screw after adjustment. The casting may be purchased, and the bell made up after the same manner as No. 1. A few rules are: length of bobbin = $\frac{1}{2}$ the diameter of bell, or slightly over. Length of core = $\frac{1}{4}$ in. less than length of bobbin. Diameter of core = $\frac{1}{4}$ length of core. Depth of winding on bobbin = the diameter of the core or slightly less. Size of wire for the bobbins of a 2 in. bell = No. 28 B.W.G.; for a 3 in. bell = No. 26 B.W.G.; for a 4 in. bell = No. 22 B.W.G.; for a 6 in. bell = No. 18 B.W.G. The magnet core may be made from a bundle of wires soldered together, or from a solid bar. Wires are best for large bells, the gongs of which are over 4 in. diameter. For the wires running in the house, use No. 20 B.W.G. tinned copper wire insulated with rubber, and two laps of cotton. If the wiring be on the surface, hold it down

with fibre insulated staples. The best work is done by cutting chases in the plaster of the walls, and drawing the wires through $\frac{3}{8}$ or $\frac{1}{2}$ in. composition or zinc tubes, and plastering the tubes in the chases. In all cases where wires go through walls, they should be run in a short length of tube for that part. For the usual method of connecting the bell with the switch and cell *see* BELL (ELECTRIC: INDICATOR). The indicator may of course be put in or left out as desired.

BELL, ELECTRIC: CONTINUOUS RINGING. A small piece of brass is cut from $\frac{1}{8}$ in. sheet 1 in. long to approximately the shape of the lever (A) in the illustration. Near one end a $\frac{1}{16}$ in. hole (B), is drilled, and at the other end a small piece of platinum wire is swetted on. Just above the hole (B) solder on a piece of fine silk covered wire, and bend it into a spiral. Another



small piece of platinum wire is sunk in, and swetted into the head of a $\frac{1}{4}$ in. brass screw (C). Drive a small brass nail through the hole (B), so that (A) will rotate freely on it, and also so that the further end just rests on the top of the hammer (H) of an ordinary electric bell, but will fall when the hammer moves to strike the gong. The screw (C) is driven in about $\frac{1}{2}$ in. below (A), and so turned that when (A) drops, the two pieces of platinum wire come in contact. Under (C) twist the end of a piece of wire, and screw it down tight, so that good electrical contact is made. The connections are made as shown in the illustration. The wire soldered on to the top of the lever (A) is connected to the same bell terminal as the bell-push (P), and the wire from the stop (C) is connected to the other terminal of the push, which is connected to the battery (D). For the rest, the bell is connected up in the ordinary way as shown. When the push (P) is pressed, (A) drops and makes contact with (C), which short-circuits the push, and the bell continues to ring until the lever (A) is lifted up. To reset the bell, balance the lever (A) on the top of the hammer again.

BELL, ELECTRIC: INDICATOR. (1) Make the required number of bobbins 1 in. long × $\frac{3}{8}$ in. diameter, the flanges being 1 in.

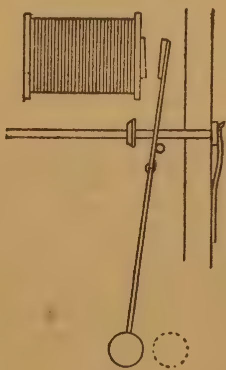


FIG. 1.

diameter, as explained above under BELL (ELECTRIC), and wind on each $1\frac{1}{2}$ oz. No. 30 B.W.G. silk-covered wire. In the centre of each bobbin

place a piece of soft wrought iron $1\frac{1}{16}$ in. long × $\frac{3}{8}$ in. diameter for the magnet core. Fig. 1 shows the bobbin with $\frac{1}{16}$ in. of the core projecting, and Fig. 2 shows the arrangement of several in one box. Cut a length of 3 in. of No. 22 B.W.G. brass wire, and to one end solder or screw on a piece of wrought iron $\frac{1}{16}$ in. thick × $\frac{3}{8}$ in. diameter for the armature. To the other end of the wire attach a disc of cardboard. This wire should then be pivoted as shown in Fig. 1, and should be almost balanced, so that the slightest touch will make it swing from one side to the other. Imagine now that the armature and wire is at rest

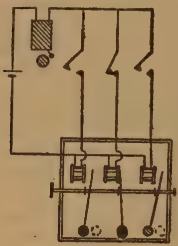


FIG. 2.

against a stop, as shown in Fig. 1, or as the two end indicators in Fig. 2. If a current be made to pass round the bobbin by pressing a key, as shown by the middle indicator in Fig. 2, the magnet core will become excited, and the armature on the end of the brass wire will be attracted. The armature should then swing towards the magnet, and assume the position shown in the middle indicator in Fig. 2. If the armature is not moved, it is either too far away, and the whole should be re-pivoted nearer the bobbin, or else the wire is badly balanced, or there is too much friction on the pivot; or else the magnet has not been sufficiently excited, and more cells should be used in the circuit. The dotted circles represent little windows of glass in the box, and when the indicator is swung over, the cardboard disc will appear opposite the window, and it can then be seen which key has been pressed. A horizontal rod of wood or brass is arranged across the box, as shown in Figs. 1 and 2. This rod has small discs or projections on it, and it slides in two holes, one at each end of the box. It is kept pressed back in one position by a spring pressing on one end of it, as shown in Fig. 1. Supposing the bell has been rung,

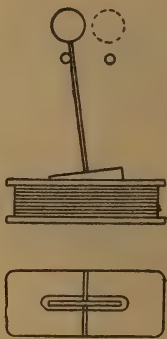


FIG. 3.

and the disc has swung over, as in the middle indicator of fig. 2, the number on the disc having been noted, the rod is pressed. The projection on the rod will knock the wire back against the stop, the spring will then press the rod back, and the indicator will then be ready to be used again. Fig. 2 gives the usual method for connecting the bell, cell, switches and indicator together. Three switches and keys, and therefore three ways to the indicator are shown, but of course any number can be fitted in the same way. It is immaterial how the box be made as long as

it will exclude dust. Great care should be taken to fix the box exactly level on the top, or else the balance of all the indicators will be spoilt.

(2) Wind three or four layers of tough thin paper 1 in. broad round an oblong mandril 1⅝ in. × ¼ in.; glue these layers together and fit on thin wooden flanges to each end as explained under Bell (Electric), in making the bobbins. When dry, and before removing from the mandril, wind on 2 oz. No. 30 B.W.G. silk-covered wire. The magnet is made from a piece of magnetised steel 1¼ in. × ¾ in. × ⅛ in. working on an axle as shown in the illustration. To it is soldered 1¾ in. of No. 20 B.W.G. brass wire, and to the other end of this wire a disc of thin cardboard is attached. This is very nearly balanced, but slightly top heavy, and only just the slightest touch should be needed to send the disc from one stop to the other. They are mounted in a box, and connected up in the same way as No. 1.

BELT-FASTENINGS. A laced joint makes the best running joint for leather, but the laces should be crossed on the outside. Patent fastenings and rivets are the handiest to tighten up when the belt runs slack. In all cases the inside of the belt should be smooth, and the heads on the outside.

BELT: SEWING MACHINE. Cut old kid gloves up into strips ¼ in. wide, join the strips together, and then twist them up tightly into a cord.

BENCH: CARPENTER'S. Cut four lengths of deal 4 in. × 3 in. × 2 ft. 6½ in. and plane them up square for legs. Cut four pieces of deal 3 in. × 3 in. × 2 ft. 6 in. for cross pieces. Fit together two frames, each composed of two legs and two cross pieces, for the ends of the bench, as shown in Fig. 1. Fit the lowest cross piece 3 in. from the ground with tenon joints, the top cross piece flush with the top of the legs with open tenon joints. Cut two pieces (A) (Fig. 2) from 1½ in. deal, 6 in. broad × 7 ft. 6 in. long, and nail them into the two frames as shown in Fig. 2. Cut two pieces

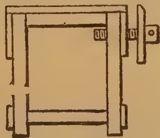


Fig. 1.

(B) from 1½ in. deal 1 ft. 3 in. broad × 7 ft. 6 in. long, and nail them on as shown. Now nail on the top, which is made from 1½ in. wood. If the bench has been made accurately it will be quite rigid, but if there be any shake, fit and screw on a cross stiffener of 3 in. × 3 in. deal, running from the bottom corner on one end to the top corner on the other. Now mark off the position of the screw and guide for the vice at the left-hand end of (B), and cut out the round and oblong holes accurately. Finally screw down, and fit in the planing stop, and any necessary drawers.

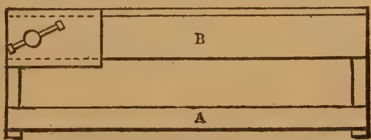
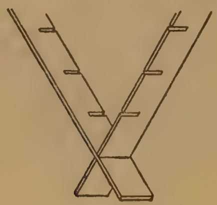


Fig. 2.

BIRDS'-EGG CABINET. This is made in principle the same as a butterfly cabinet [*see* Butterfly Cabinet], but the drawers should vary in depth. The receptacles for the eggs are often card.

board boxes, lined with cotton wool and fitted with glass lids, which are sold for the purpose. They are made so that four small boxes are equal to one larger, and thus the boxes are readily changed



as desired. The only disadvantage is that they are rather unsightly. Wooden partitions may be made with saw kerfs cut to fit together, and are permanent, as shown in the illustration.

BITS: ADJUSTABLE BRIDLE. Attach a strap and buckle to either end of an ordinary bit. Slip the straps through the side rings of a five-ringed halter, and the halter is converted into a bridle.

BITS: LEATHER. To cover an iron bit with leather, draw it over the iron wet, so that the edges come together, and channel it to allow the stitches to sink below the surface of the leather.

BLACK MINSTREL POWDER. For blacking the face and hands, cut a few corks into small pieces, dip each piece in alcohol, and place them in a metal dish. Light them, and they will be converted into black powder. Mix this powder with stale beer or water to a paste. Beer gives more gloss than water.

BLACKING: ELASTIC. Boil and mix 8 oz. white wax, 1 oz. transparent glue or isinglass, 2 oz. gum senegal, 1½ oz. white soap and 2 oz. brown candy in 3 lb. water. Then add 2½ oz. alcohol, and when all is cool, 3 oz. finely-pulverised Frankfort black.

BLACKING: HARNESS. (1) Boil together and mix 3 oz. beeswax, 4 oz. ivory black, 2 oz. Castile soap, 2 oz. lard and 1 oz. aloes in 1 pt. neatsfoot or olive oil. (2) Melt and mix together 4 oz. mutton fat and 12 oz. beeswax. Dissolve 4 oz. soft soap in water, and then dissolve in it 12 oz. sugar candy and 2 oz. finely-powdered indigo. Mix this liquid with the melted wax, and then stir in ½ pt. turpentine. Apply the blacking with a sponge and polish with a brush. (3) Simmer 2 oz. white wax in 3 oz. turpentine, and then stir in 1 oz. finely-ground ivory black. Take it off the fire and keep on stirring till the mixture is cold. Apply this blacking sparingly, and polish. (4) Mix 8 oz. finely-shred beeswax with 12 oz. turpentine, and let it stand three or four days till it is dissolved. Gradually add 4 oz. finely-ground ivory black and 2 oz. finely-ground Prussian blue to 2 oz. olive or neatsfoot oil, and then add the prepared turpentine. Should the blacking become hard with age, soften it with turpentine. (5) Mix 4 oz. beeswax, 2 oz. ivory black, 1 oz. turpentine, 1 oz. Prussian blue ground in oil, and ¼ oz. copal varnish. Make this paste up into balls, and apply it by rubbing the balls with a brush, then brushing the leather, and then polishing the leather with another brush, and finally with silk. (6) For heavy parts, melt 8 oz. tallow in 1 tablespoonful of flour paste, and then mix it with 4 oz. ivory black, 4 oz. brown sugar and a little gum-arabic dissolved in 1 qt. hot water. [*See also* POLISH (LEATHER), *and* BLACKING (LEATHER)].

BLACKING: LEATHER. (1) Mix slowly 4 oz. ivory black and 3 oz. sugar in a tablespoonful of

sweet oil and 1 pt. beer. (2) Dissolve 3½ oz. shellac in ½ pt. alcohol. Grind up smoothly 25 grs. lampblack in 6 drs. sweet or olive oil, and then mix it with the shellac varnish. (3) Dissolve a small amount of asphaltum in turpentine; add lampblack till it is as a thick paste, and then thin to the desired consistency with shellac varnish.

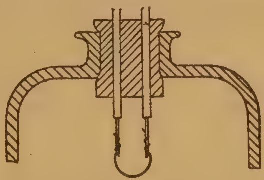
BLACKING: LEATHER, WATERPROOF. Mix 4 oz. tallow, 4 oz. beeswax, 4 oz. resin, 1 pt. tanner's oil, and lampblack to colour. This blacking is often also used as dubbin.

BLACKING: SHOE. (1) Melt together over a slow fire 4 oz. mutton suet, 1 oz. beeswax, 1 oz. sweet oil, 1 dr. sugar candy and 1 dr. gum-arabic; when melted add ½ oz. turpentine, and lampblack to suit. Pour into a tin mould to cool. (2) Mix 3 oz. ivory black with 1 tablespoonful sweet oil; squeeze in ½ lemon, and add 2 oz. brown sugar and 1 pt. vinegar; then add 1 oz. sulphuric acid and 1 oz. hydrochloric acid. (3) Mix slowly 2 oz. ivory black and 1½ oz. brown sugar in 1 tablespoonful sweet oil; then add ½ pt. beer. (4) Add a piece of tallow the size of a walnut to 1 tablespoonful of hot flour paste; then add 4 oz. moist sugar, and mix with 1 qt. warm water and a little gum-arabic.

BLACKING: STOVE. Apply black lead mixed with white of egg, turpentine, or cold tea with a paint brush, and when dry, polish with a stiff brush.

BLANKETS: HOW TO CLEAN. Dissolve 2 large tablespoonfuls borax and 1 pt. soap (which does not contain any resin) in a tub, and leave the blanket to soak in this liquid for twelve hours. Drain, and then rinse the blanket in water at about 100° Fahr. Never wring the blanket, but hang it up to drain and dry.

BLAST BOULDERS: HOW TO. Place a few ounces of dynamite on the top of the rock, and cover it with 4 to 6 in. of damp clay in such a way as to exclude all air. Fire with a fuse, cap or detonator. (2) To explode gunpowder, select a bottle of the size that will just hold the charge. Drill two holes through a tightly-fitting cork, and pass into the inside of the bottle two lengths of insulated copper wire through these holes. Connect the wire inside the bottle with ½ in. fine platinum wire, as shown in the illustration, and then



connect a Grove or Bunsen cell across the free ends of the wire. If the platinum wire does not get red hot, place another cell in series. Now disconnect the cell, take out the cork and wire, and fill the bottle with gunpowder. Replace the cork in the bottle, so that the platinum wire is covered with powder, and then fire the charge by closing the electric circuit from a distance. If gunpowder be used, it must be placed in a hole drilled vertically down in the rock to receive it.

BLEACH BEESWAX: HOW TO. (1) Melt 1 lb. beeswax, and mix with it 2 oz. nitrate of soda; then add slowly 1 oz. sulphuric acid diluted with 9 oz. water, stirring the melted wax with a glass rod. Let the wax set for a few hours, and then mix it up with hot water, till no acid is left in the wax. (2) Slice the wax into thin sheets, and expose them

to the sun till sufficiently bleached; then remelt, and mould into shape.

BLEACH BONE: HOW TO. (1) Bo l the bone in strong soapy water, to free it from grease, then rinse in clean water, and place it to dry in the sun. When dry, make it wet again, and replace in the sun. The bone must be dampened and dried in the sun over and over again till it becomes white. (2) Boil the bone in a solution of soda to remove all grease. Dissolve 1 dr. chloride of lime in 1 pt. water; immerse and leave the bone in this solution till bleached.

BLEACH COTTONS: HOW TO. (1) Tie up about 1 qt. ashes in a cloth, and boil it in just sufficient water to cover it. Tie up ½ lb. chloride of lime in a stout piece of cloth, and rub it through into the water. Make sure that the lime is completely dissolved, and then immerse the cottons to be bleached. Stir the bleaching fluid and the cloth constantly, and often lift the cloth to the surface to let in air. Leave the cloth in from a half to three-quarters of an hour, depending on its quality. (2) Mix 1 oz. oxalic acid in 6 pts. water. Stir while the cloth is in the fluid, and rinse twice in running water. (3) Dissolve 1 teacupful of borax in 12 gals. soft water, and treat the cloth as in No. 1.

BLEACH FADED DRESSES: HOW TO. Add a handful of lime and 1 gill vinegar to sufficient water to wash the dress, and boil till all the lime is dissolved. Immerse the dress in this bleaching fluid, and when sufficiently white, rinse and dry in the sun.

BLEACH FERNS: HOW TO. (1) Gather the ferns after they have turned red or brown, and when quite dry. Dissolve 1 part chloride of soda in 2 parts water. Immerse the ferns in this solution, and stand them in direct sunlight till they turn white. Rinse in clean water; flatten them on a piece of glass; dab them with a cloth, and press them between sheets of white blotting-paper to dry. (2) Dissolve 2 oz. chloride of lime in 1 qt. water, and steep the fronds in it for twenty-four hours. Then take them out, and wash them well in a solution of 20 gr. salicylic acid in 4 oz. spirits of wine.

BLEACH FLANNEL: HOW TO. (1) To whiten yellow flannel. Soak for one hour in a weak solution of bisulphate of soda, add and mix well a little muriatic acid, and cover the vessel for twenty minutes. Rinse in soft warm water, and dry in the sun. (2) Mix 1 lb. Marseilles soap in 20 lb. soft water, and ⅔ oz. spirits of sal-ammoniac. Immerse, and stir well in this, rinse in warm water, and dry in the sun.

BLEACH GRASSES: HOW TO. Expose the grasses to sulphur fumes, but if the heat damage them, heat 4 parts flowers of sulphur with 5 parts finely-powdered oxide of manganese, and pass the fumes through water, and then to a closed wooden box in which the grasses are exposed. [*See also* BLEACH WOOLLENS (HOW TO)]

BLEACH OLD LACES, ETC.: HOW TO. To bleach fine articles such as laces, which have turned yellow with age, place them in a large-mouthed glass jar, and fill up with lukewarm suds made from best white soap. Place the jar in direct sunlight, and shake the jar up occasionally, exposing a fresh face to the light each time. When bleached, rinse thoroughly in soft water. If the articles be dirty, change the suds as often as necessary.

BLEACH SPONGES: HOW TO. (1) Soak the sponges in

dilute hydrochloric acid for twelve hours. Wash them well in water, and then immerse them in a solution of hyposulphite of soda, to which dilute hydrochloric acid has been added a moment before. When they are sufficiently white, wash them in clean water and dry. (2) Soak the sponges in a 1 per cent. solution of permanganate of potassium; then rinse and wring them out, next immerse them in a solution of 8 oz. hyposulphite of sodium in 1 gal. water, to which 1 oz. oxalic acid has been previously added, for fifteen minutes. Then rinse thoroughly, and dry.

BLEACH STRAW: HOW TO. (1) Pulverise stick sulphur, and mix it to a paste with water. Plaster this thickly over the straw; place it in the sun to dry, and then brush the sulphur off. This is a method often used for bleaching straw hats, etc. (2) First steam the straw, and then expose it to sulphur fumes as for BLEACH WOOLLENS (HOW TO). (3) Soak the straw for six hours in a tepid weak solution of soda. Dissolve 9 oz. permanganate of potash in 1 gal. warm water in an earthenware vessel, and then add water till it is of a dark red colour. Immerse the straw in this potash solution, and continually agitate it till it is a light brown colour. Next wash it in clean water, and then immerse in a bath of a solution of bisulphide of soda, strong enough to give off a perceptible odour, for fifteen minutes.

BLEACH WOOLLENS: HOW TO. Place some red-hot charcoal in an iron dish on the bottom of a large box, or tea-chest. Steam or dampen the articles to be bleached, and suspend them in this box. Then strew powdered sulphur over the charcoal, and close the lid, or place a wet sack over the opening. To bleach brown cloths, first boil them in weak lye, and then hang them up out of doors to dry for a few days. If the sun be hot, keep the cloth damp by sprinkling water over it.

BLEACHING: CHLORINE. Heat 1 part by weight salt, 1 part manganese dioxide, 2 parts sulphuric acid and 2 parts water. Chlorine gas will then be given off, which will bleach all animal and vegetable substances.

BLEACHING FLUID. (1) Dissolve 8 oz. refined pulverised borax in 10 gals. hot water. (2) Put 1 lb. lime into a bucket of boiling water, and leave it for 8 hrs. Dissolve 2 lb. sal soda in 2 gals. water over a slow fire, and then mix it with the lime water. One eggcupful of this fluid is sufficient for 3 pailfuls of boiling water. It should be kept in glass jars, as it attacks stoneware.

BOAT: FLAT-BOTTOMED. (1) Size: 16 ft. long × 2 ft. 9 in. beam × 9 in. depth. Make the bottom from ⅝ in. yellow deal match-boarding, but do not press the feather, and groove together tightly; leave about $\frac{1}{16}$ in. between, or the wood will warp when it gets wet. Nail fillets (*a* Fig. 1) along the bottom over the joints, having put canvas soaked in pitch between the fillets and the match-boarding, and having given a good coat of white-lead paint to each feather and groove. Now screw down ¾ in. sq. oaks (*b*) across the bottom 10 in. apart for frames. Cut two pieces of wood 5 in. × 21 in. for the nose and stern, as shown in Fig. 2, one view looking on the top, and the other at the side. Screw these down to the ends of the centre board of the bottom with brass screws. Make the sides from ⅝ in. deal 9 in. deep. Place a piece of 1½ in. wood under each end of the bottom, and weight down the

middle, so as to make the middle sag down 1½ in. When it is thus bent, tie the sides in place, and screw them on with brass screws, placing the screws 4 in. apart along the bottom and 2 in. apart up the stem and stern pieces. Dress up the top edges of the sides level, and cut off the pieces projecting below the bottom at the ends. Now screw on a fillet (c Fig. 1). 1 in. × ½ in. round the top edge of the sides, letting ¼ in. project above, for the deck to butt against. Now steam eighteen pieces of ¾ in. oak [*see* Wood (How to Steam)], for the deck frames (d); they will be slightly longer than the corresponding of oak of the seven middle deck frames, so as to leave a hole for the well, 18 in. × 6 ft. 10 in. Now deck over with ½ in. yellow deal, and fix it down with brass nails or screws to the deck frames. Screw on a 3 in. coaming (h) round the well. Rub down the part already painted on the outside with water and pumice stone; give another coat of white lead paint, and then paint to the required tint. Fig. 3 is a view of the boat looking from above. One-half of this illustration shows the deck removed, the other half the deck in place.

(2) Cut two pieces of deal for the sides from ¾ in. boards, select

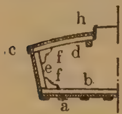


fig. 1

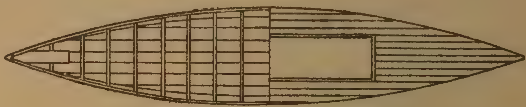


fig. 3

fig. 2

frames across the bottom. When flexible, give each beam a set of 1 in. for every foot in length; thus the centre frame will have a rise of 2¾ in. in the middle. Now fit ¾ in. oak (e) up the sides, and join them to the top and bottom portions of the frames with knees (f). Now give a good coat of white-lead paint all over, inside and out; and crowd all holes with pitch, or, if large, with pitch and shredded canvas. Screw on to the under sides of the eleven middle deck frames two pieces of ¾ in. square oak running parallel fore-and-aft 20 in. apart. Cut away the portion between these two pieces ing those of clear run without any knots, 12 ft. long × 12 in. broad. From the bottom left-hand corner mark off a point 8 in. along the side, join this mark with the top left-hand corner, and saw off the triangle thus made, as shown in Fig. 1. Cut a similar board for the other side. Cut a board from 1¼ in. deal 15 in. broad, as shown in Fig. 2, for the stern piece; 1 ft. 6 in. on the top, 15 in. deep, and 12 in. on the bottom. Cut a board from 1¼ in. deal 12 in. broad, which is only for temporary use to give the boat swell in the body, 3 ft. 6 in. long on the top, and 2 ft. 10 in. long on the bottom, as

shown in Fig. 4. Put the stern piece along the slanting edges of the sides, and screw it temporarily there. Place the remaining board 6 ft. from the stern, and screw it there temporarily with small screws. Cut a piece of wood 12 in. long × 2 in. thick × 4 in. broad for the nose piece. Taper this on both the sides, which are 4 ins. broad, till it is only ¾ in. thick on one edge, but remains its full thickness of 2 in. on the other. Bring the front ends of the sides together to form the bows, till the two corners touch. Bevel these away all down the edge till when the ends are brought together they make a fairly good useful to prevent the rope slipping. Fit the stern piece in the same way that the nose piece was fitted. Take off the rope, and turn the boat bottom upwards. Dress off the bottom all over, so that the bottom boards will fit snugly, and then give the frame a coating of paint. Use ⅝ in. deal for the bottom boards 6 in. wide, and nail them in position with calico soaked in pitch as explained for PUNT. Screw a ¾ in. deal plank 9 in. wide along the centre of the bottom of the boat, fitting into the nose, as shown in Fig. 3. Fix a seat about 7 ft. to 7 ft. 6 in. from the stern, and also seats in the bow and stern on cleats.

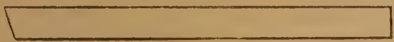


fig. 1

fig. 2

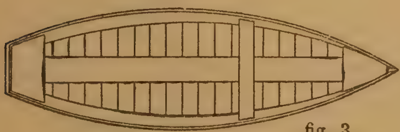


fig. 3

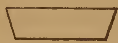


fig. 4

joint, and end with a sharp edge. Now cover the nose piece with graphite or thin red-lead paint, insert it between the two ends of the sides, and move it slightly up and down. Then look at the ends, and where they are marked cut away. Repeat this operation till a good bearing is made all down the nose piece; then insert cotton cloth or calico soaked in pitch, and screw up firmly with brass screws. Bind the stern end of the boat with a rope, so that when the screws holding the sides on to the stern piece are removed, the sides do not spring out very far. A couple of screws in the bottom edge of the sides may be These strengthen the boat at its weakest parts. Now take out the board (Fig. 4) screwed in temporarily to give the boat its swell, and plug up all the holes made by the screws with hard wood dipped in red lead. Plug up any holes with hemp dipped in tar as explained for PUNT, and then give two coats of white-lead paint, and then one coat of the required colour.

BOMBAZINE: HOW TO CLEAN. Mix 1 teaspoonful of ox gall in 1 gal. of suds, and put the clothes through by hand-pressure alone, without rubbing. Rinse in lukewarm water, in which a little gum-arabic has been dissolved. Do not wring, but squeeze

out the water, and when the goods are dry enough, iron them on the wrong side.

BONE: HOW TO BEND. (1) If the bone be thin, boil it for half an hour in a solution of washing soda and water. When soft enough, bend to the desired shape, and bind in position with wire till set. (2) For thicker bone, horn and ivory, pour phosphoric acid into a dish, place the bone in it, and expose to the air. When soft enough, bend and bind the bone in place as before. (3) Old bone may sometimes be softened by steaming [*see* WOOD (HOW TO STEAM)].

BONE: HOW TO CLEAN. (1) Tie the bones down in water for about six weeks, and then place them in a glass jar, and expose them to sunlight. (2) Place the bones near an ant mound, and leave them there till the ants have eaten them clean [*see also* BLEACH BONE (HOW TO); *and* IVORY (TO CLEAN)].

BOOK-BINDING. If the book to be bound is made from numbers of magazines, or the book is to be sewn together and cut, a press is necessary. To make the press, cut a piece of some hard wood (a, Fig. 1), about 18 in. × 6 in. × 1½ in., and plane it up true and square; then another piece (b, Fig. 1), 18 in. × 5¼ in. × 2 in. Place the two boards with their bottom edges together, and bore two ½ in. holes 3 in. up from the bottom, and 3 in. away from the ends. Fit in two ½ in. coach screws, and sink a washer at each end of each hole into the wood. Fly-nuts will be found more convenient to tighten up than hexagon nuts. Now bolt the two boards together, and cut kerfs in the bottom edges, about 2 in. apart and ¼ in. deep, with a fairly thick saw. For the cutter (c, Figs. 1 and 2, the latter being a section cut at right angles to Fig. 1), cut out a piece of iron 1½ in. × 13/16 in. × 1 in., and file up square. Then file two angular slots 1 in. apart and ⅛ in. deep, so that when the ¼ in. round wire (h, Figs. 1 and 2) rests in the slots, the bottom of the wire is exactly ¾ in. above the bottom of this small block. Now cut the slot (d, Fig. 2), 1/16 in. × ¾ in. To make the knife blade (e, Fig. 1 and Fig. 3), cut a piece of tool steel, and file it up to exactly 1/16 in. × ¾ in. full, and bevel the edges, so that it fits tightly in the slot (d). Then shape as shown in Fig. 3, and drill two holes in it through which screws are passed

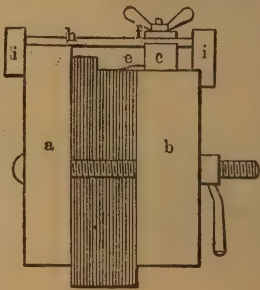


fig. 1

fig. 2

fig. 3

to fix it on to the iron block (c). When the blade is screwed in place, file the bottom lightly till all is level, then take the blade out; temper it straw, and sharpen the cutting edge on a stone. Now cut a piece of iron (f, Figs. 1 and 2), ¼ in. × 1½ in. × 1 in. for a cap. Place it on the top of the iron block (c), and drill a ¼ in. tapping hole through the centre of it, and ½ in. into the iron block. Tap this hole in the iron block (d), and drill out the hole to ¼ in. clearing in the cap. Screw in a ¼ in. stud 1¼ in. long into the block (c), and fit a fly-nut to it to bolt down the cap. Cut two pieces of ¼ in. round iron

bar (h, Figs. 1 and 2), 8 in. long, and fix them on to two sliding guide blocks (i, Fig. 1). If a number of loose periodicals are to be bound, fold all the leaves of each number, so that the margin is parallel all the way down at the back. Then open each number in the middle, pass a needle and white cotton through and back again, tie firmly, and cut off. Stand the press with the kerfs resting on a level table, and place the numbers in, perfectly square one at a time, the back of each resting on the table, and thus level with the bottom of the press. When all are in position, screw up the two clamping screws, and lift up the press. Lay the press down side ways, each end being supported, and drill holes through all the numbers through the saw-kerfs with as thin an awl as possible. It will not as a rule be necessary to drill through all the kerfs. Now pass a darning needle and twine through these holes, and tie up tightly on the outside. Slacken out the clamping screws, and raise the backs out of the press, say ¼ in. Now tighten up the screws again, and fix with acid glue across the back two or more cross pieces of strong muslin, 1 in. broad, and 2 in. longer than the thickness of the book for straps, and then glue another piece of muslin all down the back, and over these cross pieces. Take the book out of the press before the glue dries. If parchment be moistened and crumpled till perfectly soft and flexible, it may be used instead of the muslin. When dry, place the book in the press, so that about ½ in. of the front edge of the leaves project beyond the top. Then place on the cutter, slack out the fly-nut which clamps the block and knife to the two iron bars, and fix it so that the knife will cut the first few pages when slid down. Then slack out the fly-nut again, and tap the block and knife so that it will cut a little deeper, and so on till the edges are trimmed. Then prepare the top and bottom edges in the same way. The covers may be bought, or made by cutting out two pieces of pasteboard, or they may be made of papier-mâché, embossed leather, etc., ½ in. longer and ¼ in. broader than the pages. Paste the straps, or projecting pieces of muslin on the back of the leaves to these covers, so that they will open easily, and yet have no slack. When dry, paste the linen covering over the covers and then paste down the fly-leaves. If there be no fly-leaves, paste a piece of thin but tough linen paper over the straps, reaching nearly to the edges of the cover. Another good strong binding is obtained by cutting a piece of thin tough drawing-paper just the size to go round the leaves, *i.e.*, the size of two pages and the back, and cutting slits in it to allow the straps to come through. Now make it damp, not wet, and glue it on to the cover, fixing the straps down underneath. Muslin may be glued all down the back of the leaves instead of straps, but it should project at least ¾ in. from it. The muslin is then pasted down to the cover, the fly-leaf on top.

BOOK-EDGES: HOW TO GILD. Place the leaves level with the cheeks of the binding press, the cover being turned back, and screw up tightly. If necessary, file and sandpaper the leaves level. If the paper be unsized or spongy, size the edges, and leave to dry. Pour the white of a fresh egg into ½ pt. water, and beat it up till it froths slightly to form the glair. Spread this glair on the edges of the leaves; lay on the gold leaf; tickle it

down with a hare's-foot, and leave for $\frac{3}{4}$ hr. Finish by placing a piece of writing paper over the leaf and using burnishers on the top, and finally use the burnishers on the gold leaf direct.

BOOK-EDGES: HOW TO MARBLE. Dissolve 4 oz. gum-arabic in 2 qts. water. Mix colours with water, sprinkle them finely on the surface of the gum water, and curl and draw them into streaks with a stick. Hold the leaves of the book close together, and dip the edge only lightly on the surface of the liquid.

BOOK-SHELF. Saw three or four lengths of some suitable wood from $\frac{5}{8}$ in. boards 2 ft. long. Cut the bottom board 7 in. wide, the middle 6 in. wide, and the top 5 in. wide, and round off all the edges, and sandpaper. One in. from each corner of each board bore $\frac{1}{4}$ in. holes and thread these holes with blind cord, making knots in it for the shelves to rest on. Suspend the shelves by the cords on two nails driven into the wall. The nails will never draw out if inclined downwards.

BOOMERANG. (1) The boomerang is made from a piece of hard wood of medium weight, about 2 ft. to 3 ft. long × 2 in. to $2\frac{1}{2}$ in. broad × $\frac{3}{8}$ in. to $\frac{9}{16}$ in. thick in the middle. Taper as shown

in the illustration, one side being made nearly flat, and the other side convex, but the edges and ends being rounded off. Then bend to shape, which is approximately a parabola, by steaming [*see* WOOD (HOW TO STEAM)]. It is discharged by holding the convex edge forward and the flat side downwards, in the right hand. It is swung from left to right, and just before leaving go a rotatory motion is given it with the wrist. (2) Cut a visiting card to shape shown in the smaller illustration. Lay it on the left hand, the hollow side nearest, so that the arm projects, and flick this projecting arm with the nail of the right middle finger. Incline the direction rather upwards.

BOOTS: SQUEAKING. (1) To prevent boots squeaking, drive a row of pegs through the centre of the sole from toe to heel. (2) Saturate the sole with kerosene oil.

BOTTLES: HOW TO CLEAN. (1) Break a few raw egg-shells in the article, with cold water—if greasy, warm water—and soda. Shake well, and rinse with cold water. (2) Rinse with water and powdered charcoal. Charcoal left in for a few hours is also a good disinfectant. (3) If not greasy, half-fill the bottle with used tea-leaves, a little water, and a spoonful of vinegar; shake and rinse with cold water. (4) Mix hot suds, sand and ashes, and shake them up well in the bottle. Then rinse with ammonia water, then pure water. Set the bottle to drain, and when apparently dry, put it in an oven and bake it. Rinse with alcohol and cork it up. (5) Fill the bottle with blotting-paper and water mixed to a pulp, and swing it vigorously round.

BOTTLES: HOW TO MEND. Heat the bottle and the air in it to about 100° F., and press in the cork. Run cement over the cracks on the outside, and put

the bottle away to cool and the cement to set.

BOW: CROSS-. For a medium-sized gun select a board of light, strong wood 2 ft. 9 in. long × 6½ in. wide × 1 in. thick.

From the top left-hand corner mark off 11 in. to the right, and 3 in. down make another mark; join up these two points, and saw this triangle off, to form the top of the stock. From the bottom left-hand corner draw a line to a point 11 in. from the top left corner, but stopping 1½ in. below the top edge; this will form the under side of the stock. Draw a line 1½ in. below and parallel to the top edge; this will form the barrel. Cut out a ⅝ in. square 4½ in. from the right-hand end of the barrel, the top edge of the square being ½ in. from the top of the barrel. Leave the wood 2¼ in. deep where this hole comes, and bring it up to the under side of the barrel gradually, as shown in the illustration. The arrow groove must be planed out with a plough, a gouge not being accurate enough. Cut this groove ⅛ in. deep, and cut away to the bottom of the groove at the top of the stock, to form a notch for the bow-string to catch on. With a key-hole saw, cut a ⅛ in. slot for the trigger. Make the trigger from ⅛ in. iron plate to the shape shown in the illustration, and pivot it in place. If a plough plane cannot be obtained, the gun can be made as follows: Take two ½ in. boards as above, and one ⅜ in. board. Plane up, and square the edges. Screw all three boards together with ⅞ in. screws, the two ½ in. boards being outside, and the top edge of middle ⅜ in. board being ⅛ in. below the level of the two outside boards; this will form the arrow channel. Now mark off the gun as before, and put in screws, so that when the gun is formed, the three pieces are held firmly together, and the screws do not foul the trigger or the square mortice hole. Round off all the sharp edges; sand-paper, and then rub over with a woollen cloth dampened with linseed oil. The bow is best made from strips of steel spring bent to the right shape, which should be bought, but a very good substitute may be made from English yew or lancewood. For length the bow should be twice the distance from the trigger to the mortice

hole, *i.e.*, for this bow about 2 ft. 8 in. to 3 ft. For further particulars of making the bow *see* Bow (Long-), the only difference being, that it is left square in the middle to fit into the mortice hole, and is wedged in tightly with two thin hardwood wedges. To sight the gun, fasten it firmly in a vice, and shoot at least 20 or 30 arrows at a board about 20 yards off. Find the central spot of all the arrow marks, and make a conspicuous mark there. Let a piece of hoop iron into the stock just behind the trigger, and rather to one side, and file a V-shaped notch in the top of it with a three-cornered file. Drive a nail into one side, and near the other end of the arrow channel, and file it and the piece of hoop iron till the

gun is sighted to hit the central spot of the arrow marks.

Elastic Cross-Bow: A small cross-gun can be made in the same proportions as the cross-bow, but smaller and using a stiff bow. For the string use two bits of strong rubber joined together in the middle with a boot-lace to prevent the trigger and arrow from fraying it.

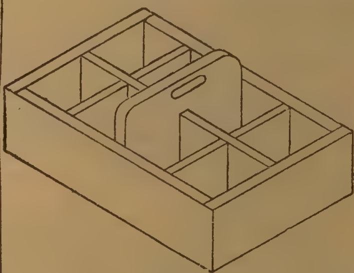
BOW: LONG-. Split a straight well-grained piece of English yew, lancewood, hickory, or similar wood 1¾ in. broad × 1¼ in. thick × 4 ft. long, and plane it up square and true to 1½ in. × 1 in. Keep this section in the middle, but at 1 ft. 4 in. from the end reduce the section to 1⅛ in. × ⅞ in.; at 8 in. from the ends to ⅝ in. × ⅝ in. bare, and just before the swelling at the end it should be fully ⅝ in. × ⅝ in. Shape with a spoke-shave to the section shown; smooth down with sandpaper, and then rub with a woollen cloth dampened with linseed oil. Finally glue a strip of velvet 6 in. long round the centre for a guide.

The old English size for the length of a bow was the height of the man who used it, and thick in proportion; the arrow being the length of the arm from the arm-pit to the extended middle finger. These dimensions will, however, be found too big, and the weapon too strong for any one who has not had a great deal of practice. The notch cut from the string should be to such a depth that if the swelling were planed off, the notch would leave a small mark. For a bow 6 ft. long, the arrows should be 2 ft. 9 in.; for a 4 ft. bow, 1 ft. 10 in. long. All the arrows for a particular bow should be of exactly the same weight and size. [For arrows *see* ARROWS.]

BOX: BULB-. Make a box of ½ in. deal 1 ft. 8 in. long × 10 in wide × 7 in. deep or of a pro portional size, and nail together with 1 in. brads.

To ornament, select straight twigs with the bark left on about the thickness of the little finger. Split them in half, and tack them upon the box. First go round the edges, top and bottom; then up and down at the corners, and then divide into panels by tacking strips up and down at suitable distances apart; say five panels each 4 in. wide. Fill each panel with strips parallel to the four sides, and lessening in size till only a 2 in. square is left, and fill these squares up with a thin piece of wood. Line the box with zinc, or paint the inside with white-lead paint. Give the little panels a coat of white paint, and glue pressed ferns or bright leaves on them. Finally give the box a coating of varnish.

BOX: NAIL-. Make the box about 15 in. long × 10 in. wide × 4 in. deep. In the centre have



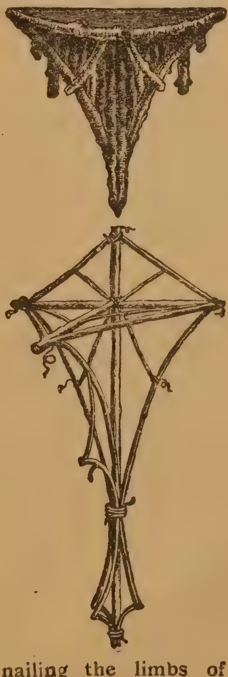
a hand-piece, as shown, and divide the sides each into four sections.

Make the ends, sides and hand-piece of ¾ in. deal; the compartment divisions of ½ in. deal. Make the middle division piece as shown in the illustration, and the cross- and handle-pieces in a similar way, so that they fit one into the other.

BOX: WINDOW-. (1) From 1 in. deal make a box 15 in. deep, as long as the window-sill is wide, and 18 in. broad. Taper the box so that it is 18 in. broad at the top, and 14 in. at the bottom. Place it inside the room, and mount it on legs to bring it on a level with the window-sill. It should be painted, stained, covered with virgin cork, or covered with sticks, in a rustic fashion [*see* Box (Bulb-)], the sticks being pealed, and then the whole varnished. The inside of the box must be thoroughly painted with white-lead paint, or better, lined with a water-tight zinc box. Over the bottom spread broken flower-pots or stones 3 in. deep; in this set a double row of flower-pots, and then spread sand over the stones, and fill up with earth to the level of the top of the pots. Between the pots, bulbs, slips, and small plants may be started; and at the corners any creeping plants, which may be trained over stiff wires set from corner to corner in the form of an arch. (2) This box is placed outside the window, and for length should fit snugly against the bricks at each end. Make it 12 or 14 in. broad × about 15 in. deep, and bore a few holes in the bottom, to drain off the water. If made of wood, it should be stained and oiled, or it may be made rustic fashion [*see* Box (Bulb-)]. Other ways are (*a*) to tack on virgin cork, and then varnish. (*b*) Cement in tiles, and hold them in place round the edges with a stout beading of wood. (*c*) Cover the box with linoleum painted to represent tiles. Paint the inside and fill as explained for No. 1.

BOX: WOOD-PILE. Pile a number of straight twigs together evenly, gluing each firmly in place as it is laid on, until the piles are of the required size. When the glue is dry, saw the pile through crossways in slices, until a number of sheets of log-veneering, so to speak, are made. Take a plain deal box, paint the inside or line it with tin-foil, silk, etc., and cover the top, front and back with split spruce glued side by side. Now cover the sides with the log-veneer; polish the ends, and varnish all over.

BRACKET: RUSTIC. Brackets can be made by gluing



and nailing the limbs of trees

together as shown in the illustrations, or by splitting them down the centre and gluing them into a frame of boards [*see* Box (Bulb-)]. The lichens found on decaying logs may be dried and glued on, and the bracket then varnished all over with coachmakers varnish.

BRASS: HOW TO HARDEN. Brass and copper can only be hardened by rolling or hammering. Very soft brass may be made a trifle harder by heating it to redness, and then allowing it to cool slowly.

BRASS: HOW TO MELT. Place the brass in a sand crucible with borax, and bed it well down in the fire.

BRASS: HOW TO SILVER. Before silvering the brass by any method, remove all grease from the metal by boiling it in a caustic potash solution; rinse, and then rub down with pumice powder and water. (1) Mix 1 oz. silver nitrate or silver chloride, 2 oz. common salt, and 7 oz. cream of tartar to a paste with distilled water. Put some of this on the brass, and rub it in with a cork cut in half, or with wash leather. Then wash, dry in boxwood sawdust, and lacquer or varnish to prevent oxidisation. (2) Mix 4 parts silver chloride, 8 parts washing soda, and 5 parts common salt with warm water till as a thin cream. Rub the mixture well on to the brass; then wash, and lacquer. (3) Dissolve 10 grs. silver nitrate in a wineglassful of distilled water. Dissolve 60 grs. cyanide of potassium in a wineglassful of distilled water. Mix these two solutions together, and boil the brass in the mixture for a few minutes.

BRASS: HOW TO WET-COLOUR OR FROST. (1) Boil the brass in caustic potash; rinse it a few times in water, and then dip it into commercial nitric acid till all oxide is removed. Then rinse quickly; dry in boxwood sawdust, and lacquer. (2) Rub with emery stone as though using a scraper.

BRASS: HOW TO WHITEN. Boil 2 lb. grain tin, and 1½ lb. cream of tartar in 1 gal. water. Clean the brass, and then pickle it in the mixture for a few minutes. [*See also* Brass (How to Silver)]

BRAZING. File and scrape the surfaces to be joined bright and clean, and finish with emery cloth. Dissolve 8 oz. borax in 1 pt. water, and dip the cleaned metal in it. If there be parts over which the solder and flux might run while liquid, mix black lead with water to a paste, and paint over these parts with it. Mix 1 part powdered borax with 2 parts powdered spelter [*see* Solder (Hard or Brazing)], and apply it to the surfaces to be joined. Lay the metal on asbestos, and heat it with a good large gas blow-pipe. If the metal be thin, care must be taken not to burn it. Run a stick of solder round the edges of the joint, when the powdered borax and spelter is liquid, and then holding the two pieces of metal together with a pair of tongs, brush off all the molten borax and spelter round the edges with a wire brush. Small articles may be brazed with a Bunsen burner, or even a spirit lamp. They may also be brazed by sprinkling the surfaces with powdered borax and spelter, and then clamping them together with black-hot pliers and keeping them thus till the spelter solidifies.

BRICK-WORK. *Bevel Joint:* Press back the upper portion of the joint, while the mortar is wet, and cut off the lower edge square. The sloping edge throws off rain.

Paving: Paving bricks are made specially hard, and are 1¾ in. thick. They should be laid on edge, and if

the situation be dry, they should be laid on sand; if damp, they should be laid in cement mortar, and cement grouted between each individual brick.

Pointing Joint: Make the pointing mortar of 2 parts clean fine sand, 1 part cement, and a little white lime. Mix only a small quantity at a time, and use it at once. It is best to point brickwork after heavy rains. If, however, the brickwork be dry, wet it thoroughly—not merely dampen it with a brush. Remove the original mortar to a depth of ½ in. to ¾ in., and fill up with the fine mortar. Then (1) Bevel off with a trowel, and cut square, or (2) Colour the mortar, rub it down with a brick of the same colour, and cut a narrow groove down the centre. When the mortar has set, press pure white putty into the groove, and allow it to project ⅛ in.

BRIDGE: FRESHET. Where streams are liable to rise and sweep away small bridges, use a plank, with the end next to the side of approach fastened by a chain to a stake, fixed firmly into the ground.

BRIQUETTES: COAL. (1) Mix 12 to 14 parts coal dust with 1 part liquid tar; work till thoroughly mixed, and then press into moulds. (2) Mix coal dust and tar with just enough clay to make the mass cohere. Work together till thoroughly mixed, and then press into moulds.

BRONZE BRASS: HOW TO. The brass must first be thoroughly cleaned and all grease removed. During the operation it should be held with brass wire, and not touched with the fingers. If not successful at first by immersion in the liquid, try drying the metal over a Bunsen burner or a spirit lamp. The proportions of the receipts may often be altered with advantage, as brass alters so much in composition that a receipt cannot be always given which is equally good for all varieties. In nearly all cases, including all the greens, the brass should be washed, dried and burnished after immersion. In a good many blacks and browns the brass should be lacquered.

Black: (1) Paint with a mixture of a solution of platinum chloride and nitrate of tin. This gives the rough black often seen on instruments. (2) Mix equal parts concentrated silver nitrate and concentrated copper nitrate, and shake up well. Immerse the brass in the mixture for a short time, then take it out, and heat evenly till the dull black colour comes. (3) Dissolve copper wire in 1 part nitric or sulphuric acid, and then add 2 or 3 parts water. Heat the article, and quench it in the solution; take it out, and heat again over a Bunsen flame or a spirit lamp. A green tint first appears, which eventually turns to a dead black. Finally, brush over thoroughly. This receipt is often used for instruments. [4] Immerse in a boiling solution of copper sulphate, alum and verdigris.

Brown: (1) Heat the brass to about 120° Fahr., and then immerse in, or paint on, a solution of chloride of platinum. This is chiefly used for small articles. (2) Immerse the article in a solution of nitrate or chloride of iron; or a solution of 2 oz. nitrate of iron and 2 oz. hyposulphite of soda in ½ pt., water. (3) Dissolve 1 oz. corrosive sublimate in 1 oz. vinegar. This gives a rapid dark bronze. (4) A solution of nitro-muriate of platinum, sometimes called ter-chloride of platinum. A very rapid dark bronze. (5) Bind the brass with fine iron wire, and dip it in dilute sulphuric acid till of a red colour; then polish with black lead, and lacquer.

This is a cheap, but not very good method.

Chocolate: (1) Mix rouge with a little chloride of platinum and water to a paste, and apply with a brush. When dry, polish with a medium stiff brush. (2) Thoroughly clean the surface, and cover with a thick coat of rouge and water. When dry, place the article in a hot fire-brick oven till the rouge has turned to the desired colour. Polish with a soft brush and rouge powder, and finally with chamois leather. This method is not suitable for soldered articles. (3) Melt and mix 1 oz. flowers of sulphur and 4 oz. pearl-ash in an iron ladle over a fire. Pour it out on to cold metal or stone; and when cold, place it in a jar, and pour 3 pts. boiling water over it. Leave it to settle, and then pour off the clear liquid. Dip the brass in nitric acid, wash, and then dip into the mixture; hang up to dry, and dip again. (4) Mix 1 oz. potassium permanganate and 5 oz. sulphate of iron in ½ oz. hydrochloric acid and 6 lb. water. Immerse the brass articles in this for ½ min., and if of the required tint, wash and dry in sawdust. If the articles be too dark, or a redder shade be desired, immerse for 1 min. in the following immediately: 1 oz. chromic acid, 1 oz. chloric acid, 1 oz. potassium permanganate and 5 oz. sulphate of iron in 6¼ lb. water at about 140° Fahr. Then rinse and dry in sawdust. If the articles be afterwards heated in an oven, the colour is greatly improved. (5) Cover with damp iron oxide, heat to a high temperature, and then polish with graphite.

Green: (1) Dissolve 1 part perchloride of iron in 2 parts water. After immersion wash, dry and brush. The depth of tint depends on the length of immersion. (2) Give the brass repeated washes of dilute acetic acid, and expose it to ammonia fumes between each application. This is a good but long operation. (3) Paint with a solution of iron and arsenic in nitric acid. Then polish with lead glance, and lacquer. (4) Mix 2½ drs. hydrochlorate of ammonia and 1 dr. salts of sorrel in 1 pt. dilute acetic acid. Apply in a warm room with a soft brush till of the required tint, allowing one coat to dry before applying the next. These receipts for colouring brass green may be used for making bronze castings look old or "antique".

Steel Colour: (1) Immerse the brass in a boiling solution of arsenic chloride. (2) Mix 10 oz. green copperas, 8 oz. arsenic and 2 handfuls spiegel eisen in 7 lb. hydrochloric acid. Immerse the brass, and when it turns green, take it out and rub it with a scratch brush, using plenty of water. Then re-immerse for a moment; rinse, and scratch brush very lightly; rinse again; dry in sawdust; burnish, and lacquer. This is a cheap method often used for gas-fittings, etc. (3) Immerse in a solution of chloride of antimony. This gives an almost violet tint.

BRONZE IRON: HOW TO. Clean the iron and immerse in a solution of sulphate of copper till covered with metallic copper; then treat as in BRONZE BRASS (HOW TO).

BRONZE PLASTER CASTS: HOW TO. Dissolve 1 oz. sal-ammoniac, 3 oz. cream tartar, and 6 oz. common salt in 1 pt. hot water, and add 2 oz. copper nitrate dissolved in 1 pt. hot water. Mix well and apply with a brush. [*See also* BRONZE POWDER.]

BRONZE POWDER. Plumbago may be added to any coloured metal powders to vary the shade. (1) Grind up the various metal leaves with honey in a mortar. Then add water two or three times and decant, eventually leaving the

metal as an impulpable powder. (2) Dissolve copper wire in nitric acid, then add iron filings, which will cause a bronze-coloured precipitate to fall. Wash this precipitate many times, till perfectly clean. (3) Mix and heat till melted together 100 parts sulphate of copper and 60 parts carbonate of soda. Then cool, grind, and add 15 parts fine cast-iron filings. Heat to a white heat for 20 mins.; cool, powder, wash and dry. This gives a rusty-red powder.

BROOMS. Select brooms made of vegetable fibre with a greenish tint. Hang them up by a ring fixed in the end when not in use, but do not hang them up near a fire. If wetted in boiling suds once a week, they are toughened and rendered more flexible. A broom out of shape should be damped and kept in shape under pressure till dry.

BROOMS: RUBBER. Make the head from 1 in. hard wood 6 in. deep × 20 in. long. Fix the pole firmly in the centre of the broad side, and brace firmly in position. Place a stiff piece of rubber about 3 in. deep on the front side of the head so that it projects 1 in. below the bottom edge. Place a strip of wood over the rubber and screw it down on to the head, thus clamping the rubber in place. The bottom edge of the strip should be level with the bottom edge of the head. This broom is useful for cleaning the brick floors of stables, asphalt, etc.

BRUSH: FEATHER. Select even-sized feathers and string them with a needle and twine at the base of the feathered part above the quill, then hammer the quills flat to make them lie close to the handle. Wet the handle with glue, secure one end of the twine and wrap the feathers round and round the handle till the brush is of the required size. As the feathers are wound on, bind the stems close to the handle, keeping the quills wet with glue. In finishing the last row, bind them tightly and evenly all down the quills. Cover the twine with enamelled cloth or leather, with the edges pinked, then sew the edges firmly and glue in place.

BRUSH: PAINT. Select bristles of uniform length and quality. The best grow on the shoulders of large swine. Select a common iron ferrule either round or oval. If the ferrule be round the handle should be round also; if oval, the handle should be flat with rounded corners. Fill the ferrule

with the bristles—the stiff ends projecting a little over the top. Part them in the centre and insert the handle, point end first at the soft end and drive it up. If the handle is going in too loosely or too tightly, take it out and add or remove some of the bristles. When

the handle is in, cut off the bristles a little above the ferrule, and incline the cut slightly from handle to ferrule. Coat the stumps with powdered resin, and apply a hot iron to sear the stumps and melt the resin. Then give the ferrule and the top of the bristles two coats of red-lead paint.

Bridling: Cover the upper half with leather, and stitch it on, or wind with cord. The leather should only be drawn tight enough to keep the bristles straight.

Cleaning: If used only occasionally, paint brushes may be washed with soap. Get rid of all the paint possible, saturate with soft soap, and work with the finger in warm soft water. Turpentine may

be used to start the paint from the middle. Then rinse until clean, and straighten the bristles, and when nearly dry, loosen the bristles to prevent the brush drying hard. If used often, soda only dissolved in cold water should be used. After well shaking, stand them on the handle in a shady place. To clean striping brushes, dip them in turpentine and wipe them on a cotton cloth, as long as colour is shown. Do not wipe brushes on the sharp edge of tin. After washing, roll paper round the bristles to keep them straight, and hang the brushes up.

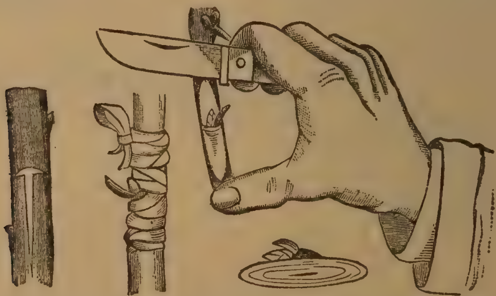
Improving: Before using, place the brushes bristles upwards, and pour good varnish into the roots; then leave for two or three days for the varnish to dry before using the brush.

Keeping: If the brush is to be used frequently, let it stand in water or oil, or in a covered tin of slow-drying varnish.

Striping: Striping brushes are best made from camel's hair, or the long straight hairs from a squirrel's tail. Comb out the hairs even, make them into bunches, and wind a part near the roots with fine thread; then draw the bunch into a suitable quill from the large end to the small.

BRUSH: VARNISH. Use a brush about 1½ in., to 2 in. wide, and preferably flat. To clean, wipe the brushes and dip them in methylated spirits, and wipe till dry. Never wash them in turpentine.

BUDDING. The shoot from which the buds are taken must be of the current year's growth, and must have buds formed at the axils of the leaves, and at the end. The best buds for budding are those about the centre of the shoot. The bark must be in a condition to lift easily from the wood, and there must be sufficient sap between the two. Do not prune at the time of budding or just before, for the bud requires shade. If possible, bud on damp or cloudy days, late in the afternoon or in the early morning.



Shield Budding: Cut a scion containing several good buds, and choose the north side of a smooth young limb for the stock. With a sharp thin-bladed knife cut a slit through the bark, but not into the wood, 1 in. long, and a cross cut on the top of it. From the scion slice out a good bud, and leave a little of the bark attached. If cut into the wood, pick out the wood with the point of the knife without bruising the bark. Raise the bark of the stock, slipping the bud into the slit, and press it down to the bottom of the slit. Finish by binding with soft string or wool, to exclude air and moisture from all, except the point of the bud, as shown in

the illustrations. Do the whole process as quickly as possible. Loosen the bandages after 7 to 10 days.

BURNISHING. Burnishers can be made out of old files. These should be softened, filed and ground up to shape, polished, and then tempered to straw. Finally polish on a leather strop with polishing rouge, Venetian tripoli, or putty powder. Long handles should be fitted to the tools for working at the vice, so that they may rest on the arms or shoulders, and so greater pressure used. For lathe work, medium short handles are sufficient. There are two distinct methods of burnishing: (1) This method consists of two operations (*a*) "Roughing," in which operation the tools have a sharp edge; and the metal is scraped, soapy water or decoctions of linseed oil being used as a lubricant. (*b*) "Finishing," which is the true burnishing; the tools being made of steel or agate, and having a rounded edge, and cream of tartar, vinegar, stale beer or alum solutions being used as a lubricant. The final finish being given with the tools worked dry. (2) First anneal the brass or gun-metal; then pickle it in nitric acid, and scour with sand. Immerse in the acid again till the metal is of the same colour all over; then rinse and dry in box-wood sawdust. Apply liquid ox-gall to the parts to be burnished, and then a solution of cream of tartar. Then burnish, and when finished rinse and dry in sawdust.

BUSHES: HOW TO KILL. Cut down the bush in August; all branches above the size of the thumb should be cut below the level of the ground.

BUTT: GARDEN WATER-. Take a water-tight barrel, and put it on a platform 6 ft. or more high, and at the bottom fix a common faucet. Procure a rubber hose, and at one end fit a fine spray nozzle, which can be taken off and put on, and at the other end fit on a union joint, the faucet having a screw cut on it to fit. Fill the butt with rain water in the morning, leave it all day exposed to the sun, and water the plants at night. Keep iron scraps and filings in the butt. Ammonia or any chemical needed can be mixed in it, and applied with the hose.

BUTTERFLY CABINET. Almost any wood, cedar excepted, is suitable for a butterfly cabinet; but if the drawers are dovetailed or tongued, hard wood such as mahogany or oak should be used. The drawers are usually about $2\frac{1}{2}$ in. deep. A stock size for an eight-drawered cabinet is 22 in. high × 18 in. wide × 11 in. deep over all. If the bottom board be $\frac{1}{2}$ in. thick, and a fillet $\frac{1}{2}$ in. deep placed below

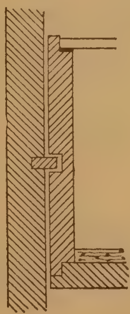


Fig. 1.

Fig. 2.

it for a stand, and a $\frac{1}{2}$ in. board for the top, the outside dimensions of each drawer will be $17\frac{1}{4}$ in. wide × $10\frac{5}{8}$ in. broad × $2\frac{9}{16}$ in. deep. The sides and back of the body, and the fronts of the drawers should be made from $\frac{5}{8}$ in. wood; the bottoms, sides and backs of the drawers from $\frac{1}{4}$ in. wood. The drawers are best made with dovetail joints for the back to the sides; lap dovetail

joints for the front to the sides; and tongue and groove joints for the back, front and sides to the bottom. Groove and tongue joints throughout are however satisfactory. Two good methods are shown in Figs. 1 and 2 for fixing the glass in the top of the drawer. Fig. 1 shows the cheapest and easiest method. In this the glass is hinged by tape at the back, and let into a groove all the way round, the bottom of the groove being covered with velvet, as indicated by a thick line, to exclude dust. Fig. 2 shows a better method. The sides are cut in two all the way round, and the glass is permanently fixed in the upper section. The two sections are hinged together at the back, and velvet is glued down at the joint, as indicated by the short thick lines. One of the most satisfactory ways of supporting the drawers in the chest is shown in Fig. 1. Grooves are cut in the inside of the sides of the chest from the back to within ½ in. of the front ⅛ in. deep × ⅛ in. broad; and feathers ¼ in. × ⅛ in. are then glued into these grooves. Grooves ⅛ in. × ⅛ in. are cut in the outside of the sides of the drawers to within ½ in. of the front, which exactly coincide with the feathers in the chest for them to slide in. A space is left between the drawer and the feather in the figure, but it is only so drawn for clearness. The joints should be as tight as possible without actual sticking, and powdered French chalk or black lead may be rubbed on the feathers for lubrication, if necessary.

Soak the sheets of cork which are to line the bottom, and which can be purchased from any naturalist, in corrosive sublimate solution; then fix them on to the bottom with paste or glue, to which carbolic acid has been added. Carbolic acid powder should in addition be pressed into the holes and between the joints of the pieces of cork, and camphor kept in each drawer in small perforated boxes fixed in the corners.

BUTTERFLY WINGS: HOW TO COPY. Remove the wings from a butterfly with a pair of forceps, and brush pure collodion over them. Brush collodion also on good stout paper, and then place the wings on the paper in their natural positions. The whole must be done quickly before the collodion dries. When dry, remove the wings from the paper, and then draw the body of the insect in position.

CANDLE COMPOSITION. Melt 10 oz. mutton fat, ¼ oz. camphor, 4 oz. beeswax and 2 oz. alum. Dip or mould them in the usual way.

CANE-WORK: HOW TO WASH. Wash the wrong side of the cane with hot water and a sponge till thoroughly soaked, but only use soap with the water if it be very dirty. Then wash lightly on the right side without soap, and leave to dry in the open air.

CARBON PAPER. (1) Melt and mix 2 oz. tallow, ½ oz. powdered black lead, ¼ pt. linseed oil, and enough lampblack, Paris blue or suitable pigment to bring to the consistency of cream. Rub this mixture well into the paper whilst hot. (2) (*a*) Powder coarsely and mix 10 oz. Paris blue, 20 oz. olive oil and ¼ oz. glycerine. Expose to the hot sun for a week, and then grind as fine as possible in a mortar. (*b*) Melt ½ oz. yellow wax with 7½ oz. ligroine, and then add it slowly and mix it with 3 oz. of (*a*). The mass, which should be like honey, is applied with a stiff brush to one side of tough thin paper, then rubbed in evenly, and dried for a few minutes at the temperature of boiling water.

CARDBOARD: HOW TO HARDEN. Pickle the cardboard

in silicate of soda for 3 hrs., and then hang it up to dry.

CARPETS: HOW TO CLEAN. (1) Cover the carpet with old damp tea-leaves or scraps of paper, and then brush them off. Only touch the carpet lightly with the broom, half the weight of the broom being sufficient pressure. (2) Dip a white cotton or woollen cloth in a pail of clean water, to which a little hartshorn may have been added, wring the water out, and rub the carpet with it. Immediately the rag becomes dirty, rinse the rag in the pail, wring it out, and rub again. If the carpet be very dirty, a scrubbing brush and soap may be used. (3) Dip a clean woollen mop in a pail of water, in which there is a little hartshorn, or in a pail of soap suds. Wring the mop half-dry, and then rub the carpet hard. The mop should be rinsed after rubbing every yard or two, and clean water frequently replaced in the pail. Then go over again with clean warm rinsing water, to which alum should be added if there be any green in the carpet; and then go over with a dry mop. However a carpet be cleaned, the surface only should be dampened, and not made wet through.

CARPETS: HOW TO LAY. Put brown paper or folded pieces of newspaper under the carpet before laying it down. For stair carpets it is best to nail old carpeting or several thicknesses of canvas before putting down, or paper may be used. Buy more stair carpet than is necessary and move it up several times each season if much used, so as to bring a new surface at the edge of each step.

CARPETS: RAG. Cotton rags should be cut a little wider than woollen rags if both are to be used in one mat; and each colour and material should be wound on separate balls. Take breadths of the same kind and colour and sew them across twice, preferably with a lock-stitch sewing machine. Tear the strips the width required, cutting across the seams. If a smooth carpet be required, use chiefly cotton rags, and a few thin woollen ones. Any light, mixed or plaided woollens are improved by dipping them in a good red dye. Clean white rags may be dyed before being woven. Light rags weigh 1 to 1½ lb. per square yd.; heavier rags 1½ to 2 lb. per square yd. Measure the size of the carpet required, and send the rags to a weaver with a pattern, bearing in mind that carpets often shrink in length, and stretch in breadth after being made [*see also* RUG (WOVEN)].

CARRIAGE: HOW TO CLEAN. Remove the mud by dashing water over the carriage. Do not use a cloth of any sort till the mud has disappeared, or the grit will scratch the varnish; then apply a sponge well saturated with water. If possible, do not let the mud dry on, but wash the carriage while it is still wet. Polish with chamois leather, taking care never to use the same leather for the body of the carriage, that has been used on the hub, or on anything greasy.

CARRIAGE: HOW TO PRESERVE. Carriages should not stand still in the sun, but they should either be placed in the shade, or kept in motion. When standing in the coach-house a covering made of American cloth should be drawn over like a sack, or it may be made large and square to hang over the sides and ends. Do not keep carriages with the leather tops down, and open the aprons frequently. The coach-house should be separate from the stables, or the varnish will dry and crumble off, and the leather will then crack.

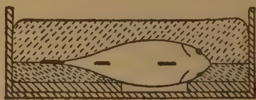
CARRIAGE RATTLING: HOW TO PREVENT. If necessary put a washer of sole-

leather on the spindles of the axle-trees, also rubber between the thill iron and clip. Coal oil on the circle stops squeaking. Nuts which periodically work loose should have locking washers or nuts put on. A good lock nut is one with a slit in it near the top, and when the nut is screwed up tight, this slit is closed with a blow from a hammer. Spring washers are also very good. A common way is to cut a notch in the screw just at the top of the nut with a flat chisel, holding a weight or "dolly" on the opposite side of the nut.

CASE-HARDENING. (1) Place the article to be hardened in an iron case at least 1 in. longer in each direction than the article, and then ram in tightly shreads of horn, hoof, bone or leather, the shreds being either dry or mixed with vinegar and salt, or white wine. Subject all to a blood-red heat for from 5 mins. to 2 hrs., depending on the size of the article, and then quench in cold water. This will give a hard skin about $\frac{1}{16}$ in. thick. (2) Polish the surface of the metal, heat to a bright red, and rub the surface over with (*a*) prussiate of potash; (*b*) mixture of 3 parts prussiate of potash, and 1 part sal-ammoniac; (*c*) mixture of 1 part prussiate of potash, 2 parts sal-ammoniac and 2 parts bone dust. Allow the metal to cool to a dull red before quenching it in cold water. This method only gives a hard skin of no appreciable thickness.

CASTINGS. For making the mould to cast small articles of zinc, lead, etc., mix equal parts sand and plaster of Paris. Allow it to set thoroughly, and then dry it in an oven, for if there be any moisture left, the castings will be spongy or blistered. For larger articles use ordinary moulder's sand, and make it so damp that it will readily cohere but will not stick to the fingers. Dust over the patterns and along the junctions of the sand with finely powdered resin or burnt sand.

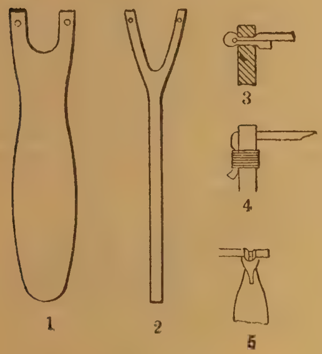
CASTS: PLASTER FISH-. First wash the fish in dilute sulphuric acid or strong vinegar to remove the natural slime, and then dry. Place it on a piece of wood or cardboard and nail a fence round about 1 in. higher than the highest part of the body. Now pack underneath the fish with small pieces of wood and fill up with well-mixed and medium thin modeller's clay until the lower half is enveloped, and then smooth the top of the clay all round with a putty knife. Mix up *best* plaster of Paris in water, a little at a time, to the consistency of thick cream, and pour it over the fish till it is covered over 1 in. thick, as shown in the illustration. After 30 mins. lift up



the plaster, and tap it till the fish falls out. Coat the inside with a lather of shaving soap and oil, and fill up with best plaster made up to the consistency of thick cream. The cast will be an exact reproduction of half the fish on a plaster slab. If it be desired to make a cast of the whole fish, when the plaster is set, after being poured over the fish on the clay base, turn the whole upside down and remove the clay, leaving the fish on the plaster. Drill four small holes round the edge of the half mould, build up clay walls and cast the other half. Now remove the fish, drill a hole in one side of the cast and fill the mould up with plaster or wax through this hole. Another way is to make a half cast from

each mould and join them together.

CATAPULT. The fork for the catapult may be cut from thickish fretwood to the shape shown in Fig. 1, or better still, cut from a hedge, and if the prongs be not exactly symmetrical, steam the wood and then bend and bind to the desired shape [*see* WOOD (HOW TO STEAM)]. Bore a hole near the top of each prong with a red hot needle for the elastic to pass through. The elastic may be fixed to the fork as shown in Fig. 3 or Fig. 4. Double over the last 1½ in. of the elastic, and place a piece of stiff thread through the loop. Pull the



end of the thread through the hole in the prong, and then pull the thread with one hand and the two thicknesses of elastic in the other quite tight, till the fork can be easily run along the thread and over the elastic. Then cut off the short end of the elastic nearly flush, as shown in Fig. 3. This method of securing the elastic is neat and safe. To thread as shown in Fig. 4, cut the end of the elastic to a long thin point, and thread it through the hole. Now damp the elastic, catch hold of it on both sides of the prong, stretch tight and press the prong along the elastic. Tie a knot in the end of the elastic to prevent it pulling out, or bind it to the fork with very fine copper wire as shown. The sling should be made of stout glove leather, or for heavier elastic, best calf. It may be bound on to the elastic with fine copper wire, or slots cut in the ends and slipped over and pulled tight as shown in Fig. 5.

CEILINGS: CRACKED. Mix whiting with glue water or calcined plaster and pure water, and apply as putty.

CELLAR: CASK. Sink a headless barrel, or a box with its top and bottom knocked out, half its depth in the ground, and bank up the excavated earth round the protruding part. If possible construct this cellar on a hill side to secure good drainage; but if not, dig a declining ditch round it, and throw in rails and straw and cover over. A tight-fitting lid should be fitted on the top, and during cold weather the whole should be covered with straw or hay.

CELLAR: DAMP. If a cellar be damp, sink a channel nearly 1 ft. deep entirely around and close to the wall, and lay a course of drain tiles in the bottom of it.

CEMENT. All cements that are melted or warmed up for use should be applied to warmed surfaces, and the temperature of those surfaces should be as nearly as possible the same as the cement. Fatty matter must be removed, particular care being taken with cooking utensils. Only as much cement as is necessary should be applied; all air should be excluded from the joint, and the surfaces to be joined brought as near together as possible, and held thus till the cement is set. For this purpose elastic bands or strips of gummed paper may be used; and with bad breakages a wax mould may be employed for a backing, to keep the

bands or strips and the broken pieces in place. The broken pieces should not be fitted together over and over again before being cemented together, or the sharp points and edges will be broken off.

CEMENT: ACID-PROOF. (1) Make a concentrated solution of silicate of soda, and form it into a paste with powdered glass. (2) Melt together and mix 1 oz. pitch and 1 oz. resin; then add 1 oz. plaster of Paris and mix thoroughly. Any cements formed of pitch, resin, etc., such as the marine glues and aquarium cements, are suitable.

CEMENT: AMBER. Dissolve hard copal in pure ether to the consistency of castor oil, and keep it in an air-tight glass-stoppered bottle. The cement should be quickly applied, and the pieces held firmly together for two or three days. Any cement which is pressed out of the cracks should be removed whilst it is wet.

CEMENT: AQUARIUM. (1) Boil 8 oz. strong glue, 1 oz. varnish and 1 oz. linseed oil or $\frac{3}{4}$ oz. Venice turpentine together and thoroughly mix. This cement takes about three days to set. (2) Melt 1 eggcupful of oil, 4 oz. tar and 1 lb. resin over a gentle fire. If it be too brittle when cold, melt it up again and add more tar; if too soft, add more resin. (3) Mix 3 parts litharge, 3 parts plaster of Paris, 3 parts fine sharp sand and 1 part powdered resin, and keep in an air-tight bottle. To use, make up to a putty with linseed oil. (4) Warm and mix 3 parts gutta-percha, 1 part Stockholm tar and 1 part pitch. (5) For repairs; mix 2 oz. white lead, 1 oz. red lead and 1 oz. litharge with linseed oil to a putty. Cut a piece of flannel to the required size, smear it with the cement, and press it down over the crack.

CEMENT: BOTTLE. (1) Mix well-pulverised litharge with pure glycerine, and apply it all over the exposed portion of the cork, and round the junction of the cork and the bottle. This makes the bottle air-tight, yet the cork can be readily removed. (2) Heat and mix 15 parts resin, 4 parts tallow or 3 parts wax, and 6 parts dry red ochre or lampblack. Apply as sealing wax.

CEMENT: CASEINE. Caseine cements do not resist water well—unless very concentrated; but they form a material that is better than putty for inside use, and make an excellent filler for wood. (1) Knead 3 parts fresh white cheese till only pure caseine remains, and then add 1 part powdered quicklime. (2) Mix 200 parts caseine with 40 parts quicklime and 1 part camphor. Keep in an air-tight bottle, and mix with water just before use. (3) Boil Gloucester cheese three times in water allowing the water to evaporate each time. Mix the paste thus formed with the white of eggs beaten up and dry quicklime.

CEMENT: CASK. Boil 10 parts strong glue, 5 parts linseed oil varnish and 1 part oxide of lead together for 10 min., and apply hot. This cement remains waterproof as long as it is kept away from lye.

CEMENT: CELLULOID. Dissolve powdered celluloid in acetone or in camphorated spirit (camphor dissolved in methylated spirits) to the consistency of cream. After application keep the article in a warm dry place, or the cement will turn milky.

CEMENT: CHINA. (1) Apply pure white-lead or zinc paint mixed rather thicker than usual to both of the edges to be joined together, and bind in place. Paint freshly mixed is not so good as that which has been mixed some time. This is one of the best cements, if the cemented article be placed in a cool dry place, and two or three months can be allowed for the cement to

set. To cement coloured china, mix the necessary pigments with the white paint. (2) Mix equal parts of fine glue, white of egg, and white lead. (3) Mix 6 parts water with 6 parts spirits of wine, then add 2 parts wheat flour and 3 parts purified pulverised chalk. Place the mixture in a glue pot with 1 part glue and heat till dissolved, then add 1 part turpentine and leave to cool. (4) Stir and mix up thoroughly but quickly 10 parts powdered glass, 20 parts fluor-spar or pipeclay and 60 parts silicate of soda solution, and apply immediately. This cement sets very hard, and resists heat. (5) For large articles melt and mix 1 oz. beeswax and 4 oz. resin, and then add 5 oz. plaster of Paris. (6) Mix 1 teacupful of milk with 1 teacupful of vinegar; separate the curds, and add the whey to the whites of 2 or 3 eggs. Beat thoroughly together, and then add quicklime through a sieve till as a thick cream. This cement should be used immediately it is made, and it is then fireproof and waterproof. See also Cement (Glass), and add ivory dust, magnesia or whiting.

CEMENT: CROCKERY. Mix 2 parts slaked lime, 2 parts borax and 1 part litharge to a paste with water. Heat the material at the fracture before applying the cement. This cement is useful for terra-cotta, tile work, etc., and it is exceedingly strong.

CEMENT: DRY. Mix 2 parts sifted wood ash, 3 parts clay and 1 part sand with oil. This cement should be used before it begins to harden, and is suitable for out-door work.

CEMENT: FIREPROOF. (1) For earthenware tubes and pipes exposed to excessive heat, mix 4 parts peroxide of manganese, 5 parts white oxide of zinc and 1 part silicate of soda. This melts at an extremely high temperature, and forms a sort of glass. (2) Mix 8 parts dry and pulverised clay, 4 parts iron filings free from rust, 2 parts peroxide of manganese, 1 part common salt and 1 part borax. Add water till as a thick paste, apply immediately, and then gradually raise the temperature to a white heat. (3) Mix 2 parts manganese, 4 parts grey oxide of zinc and 8 parts clay, with from 1 to 2 parts linseed oil varnish. This cement is useful for chemical apparatus. (4) Mix 50 parts clay with 1 part powdered glass, and heat till the glass melts.

CEMENT: GASFITTER'S. Melt and mix 5 lb. resin, 1 lb. beeswax, 1 lb. red ochre and ¼ lb. plaster of Paris. Fine brick dust may be substituted for the red ochre and plaster of Paris.

CEMENT: GLASS. *Balsam:* Warm Canada balsam and apply it to the edges to be cemented. This cement is good for fixing lenses, etc., but it will not stand heat.

Chinese: (1) Mix 10 oz. bullocks' blood with 1 oz. quicklime, and leave it to become a stiff jelly. To use, dissolve the jelly in water. (2) Mix 40 parts slaked lime, 30 parts stirred ox blood and 1 part alum. This cement is also useful for light wood-work, basket-work, etc., and is waterproof.

Diamond or Turkish: (1) Warm, mix and filter 4 parts fish glue in 28 parts water and 12 parts alcohol. Dissolve 2 parts gum-mastic in 16 parts alcohol, and add it to the glue solution; then add 1 part gum-ammoniac. This cement resists warm, but not boiling water. (2) Mix 1 oz. isinglass, 5½ oz. vinegar, 2 oz. alcohol, ½ oz. gum-ammoniac and ½ oz. gum-mastic.

Metal: To cement glass to metal. (1) Mix best litharge with glycerine to a thick paste. Cover the surfaces to be cemented with glycerine, and apply the cement.

This cement is unaffected by oil or acid, and is very strong. (2) Stir powdered slaked lime in hot glue. (3) Line the parts to be joined with alum, press them together, and heat.

Sealing Wax: Warm the edges of the article to be cemented sufficiently to melt the sealing wax, and then bind firmly till cold.

Shellac: (1) Add 1 part turps to 2 parts shellac, and boil over a slow fire. Cut up into cakes whilst still warm, and heat over a flame before use. (2) Dissolve shellac in methylated spirits and evaporate till as a thick honey. (3) Place 20 parts shellac and 1 part flowers of sulphur in a glue kettle, and heat. Add only just enough water for all to become liquid. Then pour it out into moulds, and use as ordinary glue.

CEMENT: HORN. This cement is useful for uniting horn, but more particularly for filling up cracks in horses' hoofs. Heat 2 parts gutta-percha in a water bath, and then add 1 part powdered resin. [*See also* HORN (IMITATION)]

CEMENT: IRON. *Cloth:* To cement iron to cloth, mix 4 parts white lead, 8 parts whiting and 3 parts red lead with boiled oil to a thick paste.

Fireproof: (1) To fill up holes in stoves, mix pulverised binoxide of magnesia with a strong solution of silicate of soda to a thick paste. Fill up the cracks and heat up the stove slowly. (2) Mix 10 parts clay and 5 parts iron filings in 2 parts strong vinegar and 3 parts water. (3) Melt 1 part salt and 1 part borax in water, and then add 4 parts iron filings, 9 parts dry powdered clay and 2 parts peroxide of manganese. This forms a hard glassy cement at a white heat. [*See also* CEMENT (FIREPROOF)]

Flange Joint: Mix red-lead to white-lead ground in oil till as a stiff paste. Lay it on a flat hard surface and pound it with a hammer until soft and *elastic* and will not stick to the fingers. Cut a piece of calico the size and shape of the joint, smear over both sides of it with this putty, and bolt up. In some cases, where the faces make a good fit, the calico may be omitted. To make a washer steam- or water-tight, smear a hemp grommet or ring with this red lead putty and bolt up.

Rust Joint: (1) Mix 50 parts iron filings with 5 parts water and 1 part sal-ammoniac. This cement is best where it can be rammed into the joint between cast iron, and left for some time to rust. (2) Mix 130 parts iron filings, 5 parts sal-ammoniac, and 3 parts flowers of sulphur with 2 parts sulphuric acid and water to form a thick putty. (3) Mix 5 lb. iron filings or turnings, 1 oz. sal-ammoniac and 2 oz. flowers of sulphur to a thick paste with water. This cement is quicker drying, but not quite so strong as No. 1.

Stone: To cement iron to stone. (1) Mix glycerine with litharge. This cement sets quickly. (2) Mix oxide of lead, litharge and glycerine.

Wood: To cement iron to wood, saturate the surface of the wood with a concentrated solution of sal-ammoniac, and clamp the iron tightly down on to it.

[*See also* CEMENT (METAL)]

CEMENT: IVORY. Mix ivory powder, bone powder or egg shells with water, and grind them to an impalpable dust in a mortar. Mix this with glycerine and glue or gelatine to form a paste. [*See also* CEMENT (CHINA), or any transparent cement mixed with oxide of zinc till as a syrup may be used.]

CEMENT: JEWELLER'S. To cement small jewels and pieces of glass to metal use (1) Turkish or diamond cement. [*See* CEMENT (GLASS: *Diamond*)] (2) Mix 1 part pure gum-mastic in 2 parts solution of fish glue.

CEMENT: KNIFE-HANDLE. (1) Mix 4 oz. resin, ½ oz. shred beeswax and 1 oz. plaster of Paris. Fill the hole in the handle with this, heat the tang of the blade and force if down the handle, making it melt the cement. (2) Mix 20 parts resin, 5 parts sulphur and 8 parts iron filings and proceed as in No. 1. (3) Melt 4 oz. colophony and 2 oz. sulphur and cast into bars. To use, pulverise and mix ½ part brick dust or iron filings with the powder and proceed as in No. 1.

CEMENT: LAMP. To fix the metal rim of a lamp to the china or glass bowl: (1) Boil 3 parts resin and 1 part caustic soda in 5 parts water, then mix it with 4 or 5 parts plaster of Paris and apply immediately. This cement takes about 30 mins. to set, but if white-lead, zinc white, or air-slaked lime be substituted for the plaster of Paris, it will take longer. (2) Line the parts to be united with alum, press together and heat. (3) Mix fine plaster of Paris with gum-arabic and water. These three cements are oil and practically fireproof.

CEMENT: LEATHER. (1) Mix 1 part shred glue with 1 part shred isinglass; just cover with water and leave for 12 hours. Then bring it gradually to a boil and add pure tannin until the whole becomes "ropey" or appears like the white of eggs. Buff off the surfaces of the leather, apply the cement and clamp together. This cement is useful for making joints in leather belting in conjunction with sewing. (2) Mix 10 parts bisulphide of carbon with 1 part turpentine and add enough gutta-percha to make as treacle. Lay a cloth on the pieces of leather to be joined and apply a hot iron for a time to remove the grease. The cement is applied to both pieces and pressure applied till the joint is dry. (3) Mix 6 parts asphalte, 5 parts resin and 20 parts gutta-percha in 30 parts petroleum. Place in a bottle and stand it in boiling water for a few hours until the mass becomes thick. Then stir in 75 parts bisulphide of carbon and leave it to stand for several days, shaking it up now and again. Roughen the surfaces of the leather, apply the cement and let it dry under pressure. (4) Dissolve gutta-percha in chloroform or carbon bisulphide; spread it over the surfaces of the leather and let it dry. Then hold near a fire till softened and tacky, and join together. (5) Dissolve fine shreds of india-rubber in copal varnish. This cement is waterproof.

CEMENT: MARBLE. (1) Cut clean flat surfaces on the marble, and join with Roman cement. (2) Melt together 8 parts resin, 1 part beeswax and 4 parts plaster of Paris, and apply immediately. To fill up gaping cracks, mix 1 part resin and 8 parts beeswax with powdered marble; press it into the cracks and then rub in powdered marble from the outside. (3) Sift plaster of Paris through muslin and mix with shellac dissolved in alcohol or naphtha. [*See* VARNISH (SHELLAC)] Apply quickly, wiping away the cement from the edges as it is squeezed out. [*See also* CEMENT (MOSAIC)]

CEMENT: METAL. Before cementing metals to other materials apply nitric or some suitable acid to make it rough. Then wash with clean water. To fill up holes and cracks in metal, stir 2 oz. best chalk and 3 oz. fine metal powder in 10 oz. silicate of soda (33° strength). Knead it to a putty and press it in, and in 24 hrs. it will have set sufficiently to allow burnishing, and it will then have the appearance of the metal from which the powder was made. [*See also* CEMENT (IRON)]

CEMENT: MOSAIC. (1) Mix 4 parts purified chalk with 1 part

thick solution of silicate of soda. (2) Add the white of 5 eggs to 1 qt. milk and stir in quicklime to form a paste. Both the cements set very hard, and they may then be polished.

CEMENT: PORTLAND, HOW TO TEST. Portland cement should not weigh less than 110 lb. per bushel, and 92 per cent. should pass through a 2000 mesh sieve. It should have a tensile strength of 200 lb. per sq. in. after 7 days immersion in water.

CEMENT PUTTY. For moulding and joiners' work. (1) Mix 1 part curds of milk and 1 part lime. (2) Mix 1 part cheese, 1 part lime and milk or water to bring to the right consistency. (3) Mix 1 part slaked lime with 2 parts rye flour and linseed oil to form a putty.

CEMENT: RUBBER. (1) For cementing rubber to rubber, cut 1 cub. in. of pure Para rubber into fine shreds; place it in a wide-mouthed air-tight bottle, and add 1 pt. benzine or solvent naphtha. The rubber takes about three days to dissolve, and it should be shaken up in the bottle now and again during that time. The resulting liquid should be as honey. Apply the cement to both surfaces, leave it exposed to the air a few minutes till it becomes "tacky," and then bind the two pieces of rubber firmly together. (2) To join rubber to metal, glass, etc., place 1 oz. powdered shellac in 10 oz. strong ammonia. Shake up now and again, and in three or four weeks the shellac will be dissolved.

CEMENT: SHELL. (1) Dissolve gum-tragacanth and powdered alum till as thick as syrup, and to each teacupful add ½ teaspoonful sugar of lead, and then plaster of Paris to bring up to the consistency of putty. (2) Mix gelatine and water to the consistency of syrup; then add plaster of Paris till very thick, and use immediately.

CEMENT: SPIRIT-PROOF. Mix 2 parts manganese powder with 1 part soluble silicate of soda. Apply freely, and then coat with a solution of asphalt in turpentine or petroleum. This cement is useful for sealing bottles containing preserved animal specimens in spirits of wine.

CEMENT: STONE. (1) Mix 2 parts powdered glass and 2 parts litharge with 1 part linseed oil varnish. This cement is water- and acid-proof. (2) Melt 7 parts resin, 1 part beeswax and a little plaster of Paris. (3) Mix red-lead, white-lead and litharge, and then mix with linseed oil. To dry quickly, use larger proportions of red-lead and litharge; to obtain greater strength, use more white-lead. To apply, place thin sheets of cloth on the joints dressed with cement. This cement should be allowed about a month to dry; but it will then resist boiling water. (4) Mix 2 parts sifted beechwood ash with 1 part glue. This cement is good for uniting stone to wood. (5) Melt 2 oz. glue with 1 oz. resin and enough ochre to give it body. This cement is useful for cementing stone to wood. [*See also* CEMENT (MOSAIC) *and* (MARBLE)]

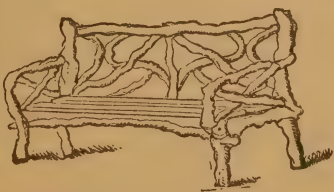
CEMENT: SURGICAL. Mix 8 parts gun cotton with 125 parts ether and 8 parts alcohol; then add 4 parts Venetian turpentine and 2 parts castor oil. For a varnish to be applied to the skin, add a little glycerine.

CEMENT: TORTOISE-SHELL. (1) File the tortoise-shell clean to a lap joint; wet the joint with water, and squeeze all along the joint with hot pincers, following them with water. The pincers should be 4 in. long in the jaw. (2) Dissolve 1 part gum-arabic and 4 parts sugar-candy in water, and then mix with 2 parts liquid glue. This cement is also useful for uniting bone and ivory.

CEMENT : TREE. Melt 10 parts pitch, then add 1 part turpentine, then 2 parts tallow, and then 1 part methylated spirits. Bind the fracture, and leave the cement to set. This is useful for cementing up broken branches and bark on trees.

CEMENT : WATER-GLASS. Mix water-glass with powdered glass, and bind up firmly. This is useful for glass. Add oxide of zinc, whiting, calcined bone or plaster of Paris to a putty for china.

CEMENT : WATERPROOF. (1) Mix Portland cement or hydraulic cement to a cream, and apply immediately. (2) Thoroughly mix 2 parts quicklime, 3 parts sharp sand, 4 parts ochre, 4 parts brick dust and 1 part very fine cast-iron filings. Mix with water to a thick paste just before use. [*See also* GLUE (MARINE); *and* CEMENT (AQUARIUM) (CASK) (ACID-PROOF) etc.]



CHAIR : BARREL. Select a strong barrel well bound with iron hoops, and rivet the hoops to each plank. Mark out the shape as shown in the illustration, and cut out with a key-hole saw. Nail a couple of cleats on the inside, and rest the head of the barrel on them to form the seat. Let in two planks at the bottom to make a steady base, and nail them there, as shown. Coarse canvas should be tacked loosely on, and filled with horse hair, and a cushion made of the same materials. The whole should then be covered with some suitable material, such as chintz, which may be folded into pleats, and button-stitched.

CHAIR : GARDEN. Shorten the back legs of an old cane or Autrian chair, give three coats of green paint and then a coat of varnish. If the seat has given way, take a piece of canvas, loop it over,

and sew firmly. Stretch it tightly in place, and temporarily tack down the three remaining sides, and then sew as for the first side. Another way is to nail the canvas on with brass-headed nails all round the edge, but this is not so satisfactory as sewing. When the canvas is fixed in place, it should have two coats of thin white-lead paint.

Rustic chairs made as shown in the illustration are also strong and useful.

CHAMOIS LEATHER: HOW TO WASH. (1) Wet the leather with luke-warm soda water, squeeze it between the hands, lay it on a flat board, and apply soap freely to both sides. Leave it for half an hour, and then squeeze it between the hands again, opening and shutting the hands, but not rubbing the leather. Rinse in several cold waters, and if necessary soap again; hang it up to dry in front of a fire, and when nearly dry, work it between the hands in front of the fire till dry.

CHARCOAL. Make a conical pile of some sound hard wood; light it, and cover it with earth.

CHESS-BOARD: HOW TO MAKE. (1) Cut and plane up on a shoot-board five lengths $\frac{1}{8}$ in. walnut or mahogany exactly $1\frac{1}{2}$ in. broad × about 13 in. long. Cut and plane up four lengths of birch

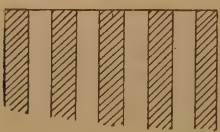


FIG. 1.

or some hard white wood to the same dimensions. Glue them together as shown in Fig. 1, which will form a board 13 in. × $13\frac{1}{2}$ in. × $\frac{1}{8}$ in. When dry, cut across the original strips, forming eight new strips made up of nine $1\frac{1}{2}$ in. squares, the final size of each strip after planing on the shoot-board being $1\frac{1}{2}$ in. × $13\frac{1}{2}$ in. Now glue together as shown in Fig. 2, and when dry cut off the projecting walnut pieces, leaving a 12 in. square containing sixty-four $1\frac{1}{2}$ in. squares. This may now be inlaid in a table, planed and polished; or if a separate board be desired, glue on 2 in. white wood strips, mitred at the corners, for a margin; then a piece of $\frac{3}{8}$ in. mahogany over all at the back; and then a $\frac{1}{4}$ in. beading of mahogany round the edges, and finally screw on two pieces of $\frac{3}{8}$ in. mahogany across, and with their grain at right

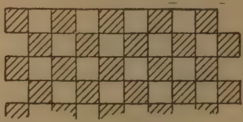


FIG. 2.

angles to the back, to prevent warping. (2) Cut a piece of plate glass 15 in. × 15 in., and grind the edges smooth with emery powder and turpentine. Mark off lines $1\frac{1}{2}$ in. from each edge, thus leaving a square 12 in. × 12 in. in the middle. Divide this square into sixty-four small squares, each $1\frac{1}{2}$ in. × $1\frac{1}{2}$ in., by marking off eight divisions on each side $1\frac{1}{2}$ in. long, and joining across to the opposite side. Paint the alternate squares black, and then fill up the intermediate ones in red or yellow. Paint the edges, which are $1\frac{1}{2}$ in. broad, with some suitable colour, and let it into a frame or table, painted side downwards.

CHIMNEY: CORRECT SIZE OF. For every fire the size should be at least 80 sq. in. Any shape may be adopted, but above the roof it is best to have it twice as broad as it is deep, *i.e.*, for one fire $6\frac{1}{2}$ × 13 in. inside.

CHIMNEY: HOW TO LOOK UP. Deflect a ray of the sun up the chimney with a mirror.

CHIMNEY: HOW TO PREVENT A SMOKING. A chimney may smoke from the following causes (*a*) Is not tall enough; (*b*) The flue is clogged; (*c*) Openings up the shaft which destroy the draught; (*d*) narrowing of the flue at the top. (*a*) and (*d*) necessitate rebuilding; (*c*) May be remedied by closing all the regulators or dampers on the same shaft; or by fixing sheet iron or wire gauze over the fire so as to lengthen the flue, the bottom being about 12 in. above the top bar. For a stove, cut sheet iron and cement it over the grate, so that no air can pass up the flue without passing through the stove.

CHINA: HOW TO MAKE IMITATION. Cut figures out of paper, but leave no white paper round the edges. Paste them on to the inside of the glass with thick gum-arabic water, and leave to dry for 24 hrs. Then clean well between the scraps with a damp cloth, and leave to dry for a few hours longer. (1) Mix white wax and flake white together, and paint the inside of the glass all over, covering the backs of the figures. (2) Boil isinglass to a jelly, and mix it with well-ground white lead, and apply as before. For a blue ground, use Prussian blue instead of white; for red, vermilion or carmine; for green, verdigris; for chocolate, burnt umber, etc.

CHISELS. *Engineer's:* To make a flat or cross-cut chisel heat the middle part of an old square file to a cherry red and draw it out to the required shape. When shaped, heat red hot and soften by placing it in sawdust. [*See* ANNEALING (*Iron and Steel*)] Then temper the point, straw to brown. [*See* TEMPERING] *Wood:* These must have a shoulder forged. Select an old flat file of the required size, heat the part just below the tang to a cherry red. Then plunge nearly all the blade of the file quickly in water, and then the tang, leaving a strip as thin as possible of red-hot metal just below the tang. Place the point of the file upright on an anvil, and strike the tang to swell out the hot metal a little. Repeat again and again till the shoulder formed is sufficient. Then soften [*see* ANNEALING (*Iron and Steel*)] and file to shape. To temper, lay the bright chisel blade on a red-hot iron, and temper the bottom 2 or 3 in. dark straw. [*See* TEMPERING] To put on the handle, which should be made of hickory or ash with a metal ferrule at each end, heat the tang of the chisel only and burn out a hole till the shoulder is about ½ in. away from the wood, and then drive the handle on. Nail two thicknesses of sole leather on the top of the handle to prevent the wood splitting when it is hammered. *Ice:* A good method is to forge a shoulder on an old ½ in. round file in the same way as for a wood-working chisel for the handle to butt against. Grind the end to a point, and then temper it to straw or brown. [*See* TEMPERING]

CIDER. Pick the apples when ripe, and store them in bins for some time before using. Pick over the apples, and throw away all rotten ones as well as all foreign matter. After being ground, the pulp should be left at least 6 hrs. before pressing off the pomace.

CIDER: HOW TO BOTTLE. Let the cider work a day or two, the cask being full so that the pomace may pass off at the bung-hole. Take a clean empty cask and put in 10 gals. cider. Thrust into the cask through the bung-hole an ignited rag sulphur match, and suspend it by a wire from the bung; after this has burnt out,

light another, and so on till three or four have been consumed. Then shake the cask violently. Pour the cider into the cask in which it is to be kept till it is full. Bung the cask tight, and let it remain in the cellar till March, then draw off and bottle. Place the bottles on the bottom of the cellar and cover with sand, or place bottom up in a trench or between two planks.

CIDER: HOW TO COLOUR. Crush blood-beets up with the cider, and when it is bottled add crushed horse-radish to it.

CIDER: HOW TO KEEP. (1) Run the cider when two days old through a filter into a clean barrel; then bung up and leave for 24 hrs. Repeat the process, and if it then show signs of fermentation, repeat a third time. Be sure no pomace or sediment is left with the cider. (2) Place the barrel in a cellar and fill to overflowing. Keep the bung out, and as the cider ferments it will overflow. When the first fermentation ceases, draw the cider off into clean casks, and bung up air-tight. (3) Place the kettles over a fire, and bring to just under boiling-point. Skim it and fill the barrels to within 1 in. of the top and bung up perfectly air-tight. (4) Pour warm clear sperm or sweet oil into the barrel after a few gallons have been drawn off. (5) Let the cider ferment till it has attained a lively fermentation. Add to each gallon ½ oz. sulphite (*not sulphate*) of lime. To mix, draw off ½ a bucketful of cider, add the quantity of sulphite of lime, mix thoroughly till as milk and then pour into the cask. Agitate thoroughly for a few minutes and then after a few days, when the cider is clear, draw it off and bottle it or return it to the cask after the sediment has been removed. If bottled it becomes sparkling. (6) Within 24 hrs. after the cider has been made, put in each barrel ½ lb. ground mustard and 1 lb. pounded horse-radish.

CISTERN FILTER. (1) Build up a wall of soft brick across the centre of the cistern, leaving it unplastered. It should be concave towards the inlet side, say 16 in. in 6 ft. Put the inlet from the eaves on one side, the pump suction on the other. The joints must be well cemented, and the separating wall must be carried higher than the overflow drain. (2) Build a partition wall across the cistern, leaving twice as much volume on one side as the other. Leave a number of 4 in. × 4 in. holes in the bottom of the partition wall, and plaster with two coats. Fill the smaller or inlet side about 2 ft. deep with charcoal, the bottom of the larger or suction side with sand.

CISTERN SCREEN. On the inlet side, where the water enters, make a detachable box of perforated zinc or wire gauze, to prevent leaves, etc., entering. It is best to make the water from the eaves fill up a small tub before entering the cistern, so that any dirt carried in suspension may settle in the tub, and only the clear water be carried off to the cistern. For this reason the outlet from the tub should be about 2 ft. from the bottom.

CISTERN WELL. At either end of a board bore holes, the distance apart being equal to the radius of the proposed cistern. Stake to the earth through one hole, and describe a circle with the other. Cut down into the ground as square as possible, using a plumb-bob. If possible place a flat stone at the bottom, and brick up from this. Do not use soft bricks, but those made of good hard clay. Bricks can be readily tested with a hammer. Lay the bricks in Portland cement, and plaster the inside

with 2 parts sharp sand to 1 part cement. Do not moisten till ready for use. If bricks cannot be obtained, make the sides as smooth as possible. Mix water and cement to the consistency of milk, and splash the wall with this, to form a crust, on which the cement given above may be plastered. The overflow drain, which should be at least 1 ft. below the level of the ground, should be made of bricks or tiles well cemented at the connections, and a guard of wire placed at each end to prevent mice and vermin entering. The drain should never be less than the capacity of the eave spouts. The well should always be kept covered with a stone and close-fitting planks of wood. [*See also* WELL (SHALLOW)]

CLAMP: GLUE. Cut from $\frac{3}{4}$ in. ash or similar tough wood board a piece 9 in. × 3 in. $2\frac{1}{2}$ in. from either end saw half-way through, and split out the piece; now make a few blocks 1 in. wide × 3 in. long of different thicknesses, and a few

wedges 4 or 5 in. long. The job after being glued is slipped between the jaws, and then the blocks and wedges driven in to hold the pieces tightly together. Similar clamps of varying sizes should be made to suit the work in hand.

CLAMP: HARNESS. Cut a block of wood 6 in. × 6 in., and bevel the two sides. Screw on two boards, as illustrated, 5 in. wide × 30 in. long, and shaped so as to set close on the top. Oak barrel staves make good clamp sides.

CLAY: MODELLING. Knead dry clay with glycerine, which prevents the clay drying.

CLOCK: HOW TO CLEAN AND REPAIR. Dip a feather into paraffin, and touch all pivots, and after a few hours repeat. Strew strong washing powder among the wheels, and plunge the works into a strong solution of the same in boiling water. Let it lie till the water is cool enough to place the hands in, then take it out, and wash thoroughly with soap and a tooth-brush. Rinse in warm water and put to dry before a fire. To take to pieces, touch watch oil to the pivots to loosen the dirt, and run the wheels. Tie the springs with strong cord, loosen the ratchet, and let down steadily by the key turning in the palm of the hand. Note carefully the positions of the wheels, and if the two largest wheels in the train are alike, scratch the strike side. Polish the pivots, and clean with a rag pressed well up against the shoulder. The pivot holes should be cleaned with a pine stick till they no longer blacken it. Put together and oil lightly. [*See* OIL (WATCH)] A clock may often be cleaned by oiling the pivots, taking out the balance-wheel and movement, and letting the wheels fly round two or three times. Then wipe the pivot holes as clean as possible, and replace the balance-wheel and movement.

CLOCK: HOW TO LEVEL. Adjust by putting bottle corks behind to bring forward, and thin strips

of wood and paper underneath to set square sideways. A good clock has a dial under the pendulum, and the pendulum should point to O when not in motion. If there be no dial, set till the door in front stays as readily in one position as another. The door must work easily on its hinges.

CLOTH: HOW TO CLEAN. Mix 1 oz. well-pulverised pipe-clay with 12 drops alcohol and 12 drops turpentine. Moisten a little of this mixture with alcohol, and rub it on the spots. When dry, rub the pipe-clay off with a woollen cloth. If the cloth be red, add a little citric acid or lemon juice.

CLOTH: HOW TO PUT NAP ON. Soak the cloth in cold water for ½ hr., put it on a board, and rub the threadbare parts with a half-worn hatter's card, filled with flocks, or with teazles, until the nap is raised. Hang up to dry, and with a hard brush smooth the nap the right way.

CLOTH SIZING. Dissolve a little india-rubber in boiling oil or turpentine, and add a little of this to thin paste while both are hot.

CLOTHES: HOW TO CLEAN. (1) Whip the clothes with a light whip, and brush. Remove spots with ammonia water, and reduce the shine with equal parts alcohol and water. Boil 2 oz. tobacco in ½ gal. water and while hot dip a stiff brush into it, and rub the clothes in all directions. When the liquid has penetrated thoroughly into the cloth, brush with the nap, and hang up to dry. When dry, no smell of tobacco will remain. (2) Clean and remove any spots as in No. 1. Steep logwood chips in boiling water till very strong; then drain, and add 2 oz. powdered gum-arabic. Rub this liquor gently over the cloth, and hang up to dry, and then brush in the direction of the nap. If the clothes be of a very light material, the logwood may have to be diluted. To clean the *collar*, break up about 3 sq. in. of soap tree bark very small, and pour ½ pint boiling water over it. Let it stand for a few hours; then apply with a sponge, and then sponge down with clean warm water. Let the collar be towards the left hand, and brush with the right, for this is the way the nap lies. Brush the back of the collar first, between the shoulders next, then the sleeves, next the inside and lastly the collar. If the *elbows* or *knees* are baggy, lay a damp cloth on them, fold the clothes up, and let them remain so an hour. Then lay them out flat, and pull gently in all directions till the swelling is removed. Then press the garments on the wrong side, finishing those places first.

CLOTHES-HORSE. Cut off and plane six pieces of deal 1 in. sq. × 5 ft. long; also twelve pieces ½ in. sq. × 2 ft. 6 in. long. Chamfer the corners of the ½ in. rods, and very slightly taper the ends

Measure off a distance from one end of the 1 in. rods 1 in. down, then 14 in below this, then 14 in. twice more. This last mark should be 17 in. from the bottom. With a

½ in. bit bore holes almost through, and then fit the ½ in. rods into these holes. When fitting, cut a groove in the rod all along the part that will be in the hole, to allow the air to escape when it is being driven in, or the upright will split. To fit, drive the rod into the hole fairly hard; twist it round, and where it is marked, take off a little. When fitted right up, put a corresponding mark on the upright and rod, and take out; do the same to each rod, and fit all together before gluing; then take one upright down, glue the projecting rods, and hammer all in place. Do the same with the others. There will now be three frames, which must be hinged together, and put on castors as shown in the illustration. Sink the hinges into the wood, so that they lie flush.

COINS: IMPRESSIONS OF. Melt isinglass glue with brandy, and pour thinly over the metal. Let it remain for a day or two till hard and dry; and then remove. [*See also* ELECTRO-PLATE]

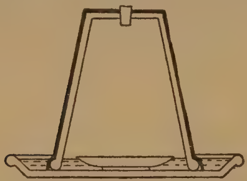
COLLAR: HORSE. Get a collar well adapted to the neck and shoulders, damp the inside till the leather is wet through, and while wet put the horse to work in it.

CONCRETE: CEMENT. The sand mixed with the cement must be perfectly sharp and clean. To wash, place the sand in running water, and stir with a stick till all earthy matter has been removed; then take out and dry. For ordinary out-door work, dig down about 7 in. and drive in stakes about 1 yd. apart, and projecting 6 in. up, to serve for guides. Then fill in rough concrete, and beat down level with the stakes, and then lay 1 in. of good cement on the top. For paths, etc., 3 or 4 in. concrete with 1 in. cement on top, will be sufficient. When the concrete is in position it should be rammed down, which process will strengthen it by from 10 per cent to 30 per cent. Concrete should not be made more than an hour before it is placed in position, and rammed down, and if possible it should be laid in cool damp weather. Ordinary concrete weighs about 120 lb. per cubic foot. (1) For rough out-door work, break up bricks to pass through a 2 in. sieve. Mix 4 parts broken bricks, 2 parts clean sharp sand, and 2 parts Portland cement. Lay this concrete 6 in. deep, and finish off with 1 in. pure cement. (2) For gravel walks, mix 15 bushels clean gravel, 3 to 5 bushels clean sharp sand, and 1 to 2 bushels lime. The coarser and dirtier the sand, the more lime must be used. (3) For the floors of stables, etc., mix 1 bag cement to ¾ cub. yd. of gravel, which should be clean, and contain sand and small stones.

CONCRETE: TAR. Heat 12 gal. gas tar, and mix 28 lb. pitch in it, then pour it over 1 cub. yd. of gravel (the largest stone to pass through a 1 in. mesh) or granite, and clean sharp sand. Shovel quickly over and over till thoroughly mixed, and then place in position, and roll or ram down 1 to 2 in. thick. Next make a concrete of tar, pitch and fine sand only, in the same proportions as before, and lay it down on the top from ½ to 1 in. thick. Then scatter Derbyshire spar or sand on the top, and roll thoroughly. To make the concrete harden more quickly, ½ bushel brick dust or powered chalk, or cinders may be added per cubic yard.

COOLER: PROVISION. Invert an ordinary red flower-pot in a soup-plate filled with water. Drive a cork into the hole at the top, and cover with a flannel cut and sewn to shape, which has been previously soaked in water, and wrung out fairly dry. The edge of the flannel must be under water, as shown in the illustration. The

provisions to be kept cool should be placed in a saucer, or supported in some way above the water, and under the flower-pot. A biscuit tin will make a larger cooler, which should be inverted, covered with flannel, and stood in the top of a larger tin lid in the same way as the flower-pot. A large safe may be made up of tin plates, with doors and shelves, and covered with flannel or serge, a flap being left in the flannel to open the doors.

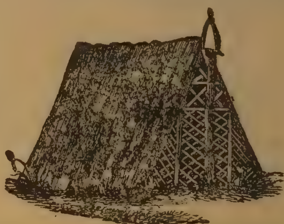


If the cooler be more than 8 or 9 in. high, water must drip on it from above. A basin of water with a syphon made of string, so that one end of the string rests in the basin and the other end on the flannel will work admirably. The size the string should be depends on its texture, and on the size of the flannel to be kept wet, but for ordinary use, a syphon which will empty the basin in twelve hours will be found sufficient.

COOP: EARLY CHICKEN. Fit a window-sash into the front of a large dry box, and leave a space of 4 or 5 in. at the top for ventilation. Let it slope 5 or 6 in. backwards to the roof. About 1 ft. of the rear end should be partitioned off, in which to feed the chicks. Place the entrance at the side, and keep dry and cool. This makes a good coop for early chickens, and in time, when the sash is no longer needed, it may be removed and slats substituted for it.

COOP: HEN. Make an end-peice of $\frac{3}{4}$ in. deal 2 ft. long at the bottom × 2 ft. high, terminating at a point. Nail on to the two slanting sides of this end-piece two boards $1\frac{1}{2}$ in. × 1 in. For the front use three pieces of deal 1 in. × 2 in., mitred and strengthened at the corners. The bottom will be 2 ft. long, the sides about 2 ft. $2\frac{3}{4}$ in. To get the exact size, measure the length of the sides of the end piece. Put on $\frac{3}{8}$ in. deal 3 ft. 4 in. long for the sides, the top course of board overlapping the

next about $\frac{3}{4}$ in. to 1 in. Leave 2 in. projecting over each end for eaves. To finish, dress out some $\frac{1}{2}$ in. sticks $1\frac{1}{4}$ in. wide, and put these up and down $1\frac{1}{2}$ in. apart. Leave an open space 10 in. wide at the centre, and to this fit a sliding door to work between two cleats, as shown. The centre stick should be 3 in. higher than the top of the



coop, and a cross-piece screwed to it to work the door by. Cover the outside with waterproof tar-wash [*see* WASH (TREE)] and the inside with white-wash. An illustration is also given of a coop made in rustic work, which may be used for the same purpose. It is not, however, recommended, except for appearance, as the holes and crannies harbour insects.

COPPER: HOW TO CLEAN. If the copper or brass be greasy, first dip it in a strong solution of potash and soda in warm water. (1) Rub over the metal with rotten stone, or emery powder mixed with sweet oil; then rub it off and polish with a dry chamois leather. (2) Heat to redness and plunge into methylated spirits or glycerine. (3) Rub a solution of oxalic acid over the copper with a cotton rag; then wash the acid off, and polish with whiting powder, and a chamois leather. This method is suitable for badly tarnished metal. (4) Steep the metal for a few seconds in a strong solution of hydrochloric or nitric acid; then rinse in water, and clean with whiting. (5) Heat the article over charcoal, and rub it with sal-ammoniac moistened with saliva; then rub dry with whiting and bran. (6) Boil 1 oz. roche alum in 1 pt. strong lye, and wash the article with this liquid, then polish with whiting or fine tripoli. (7) Mix 1 part aqua-fortis and 6 parts hydrochloric acid with 2 parts water, and immerse the metal for from 10 to 30 mins. The article will then be covered with a black mud which must be removed by rinsing—the metal being finally dried in hot, dry sawdust.

COPPER PIPES: HOW TO BEND. Fill the pipes with molten lead or pitch, and when cold bend to the required shape; then melt out the lead or pitch. Pipes filled with lead are easiest to bend, but lead is not as easily melted out as pitch.

COPPER-PLATING. To give the metal a light coat of copper, first clean it and then immerse it in a solution of sulphate of copper; or paint the surface with the copper sulphate solution, and then touch it with steel wire. To coat more thickly immerse the metal with the thin copper coat in molten copper. This latter method is not very satisfactory—electro-plating being far better. [*See also* ELECTRO-PLATE (COPPER)]

CORAL: ARTIFICIAL. Grind fine white shells or egg-shells to an impalpable dust, and then mix to a putty with gum, a little glycerine, vermilion and water. If this putty be dried under pressure, the resulting material will be exceedingly strong and hard.

CORK: HOW TO REMOVE. To remove a cork from the inside of a bottle, double a string, and drop the loop end down the neck; turn the bottle upside down, and when the cork falls in the loop, it may readily be drawn out.

CORK: HOW TO SOFTEN. Steam the sheet of cork in the same way as wood [*see* WOOD (HOW TO STEAM)], or boil it in water for a few hours.

CORK-SCREW: IMPROVISED. Insert from opposite directions the prongs of two forks. Slip a knife between the prongs, turn round, and pull out the cork.

CORK: WATER-TIGHT. Immerse the cork for about 5 mins. in melted paraffin wax till all the pores are filled. The corks must be held down by a perforated screen or similar device. Corks thus prepared make an air and water-tight stopper, which may at all times be readily removed, and are useful for fishing floats, etc.

CORN-BINDER. Cut a tapering shaft 3 ft. 6 in. long, and to the thick end attach a wood crank and handle. Cut a piece of wood 8 in. long, bore a hole in the middle, large enough for the shaft to rotate in easily, and drive a staple into each end. Attach a cord to the crank, pass it through one staple on the cross-piece, and attach a hook to the other end of the cord. When a sufficient number of stalks have been collected to form a shock, plunge the shaft through it at the height it is desired to have a band.

An assistant now takes the hook on the end of the cord, passes round the shock, and hooks it on to the free staple on the cross-piece. If the crank be now turned round, the cord will twist round the shaft, and when it grips the shock tightly, a band of straw can be withed around, and the rope loosed ready for the next.

CORN-JACK. Cut a pole 10 to 12 ft. long, and fix two legs near one end. Bore a 1¼ in. hole horizontally through the pole 4 ft. back from the legs. Place the jack where the shock is to be built; insert a rake handle, or a similar rod, about 6 ft. long, through the hole, and set up the corn round it. When the shock is complete, pull out the stick, and then by taking hold of the legs, the jack may be withdrawn, and placed ready for the next.

CORNUCOPIA. If it be desired to carve the horn, immerse it in a solution of caustic soda or potash. [*See* BONE (HOW TO BEND)] When soft enough, take it out, and wash. Then cut the design, dry, and, if desired, stain. [*See* STAIN (HORN)] Instead of carving the horn, it may be etched in the same way as shells [*see* SHELL (HOW TO ETCH)], and in that case it need not be softened first. Drive in two picture-frame screws, and attach a ribbon of a similar colour to the horn, to suspend it by. The hollow end should be finished by a piece of silk or satin fastened to the horn with glue or strong mucilage, and a ribbon passed in and out, to gather the material up.

COTTON: HOW TO CLEAN. To remove mildew spots from cotton, dissolve 1½ oz. chloride of lime in 1 qt. boiling water, and then strain. Soak the stained parts in this liquid, and then immerse them in clean water.

COTTON PRINTS: HOW TO CLEAN. Mix vinegar with the rinsing water for pink or green; soda for purple or blue goods. To preserve the colour of blue goods, dissolve 1 oz. sugar of lead in a pail of water, and soak the fabric in this for 2 hrs. Let it dry before washing it. For ordinary prints (*a*) mix 1 teaspoonful of ox gall in 1 gal. water, and soak the fabrics in it for a few hours before washing. (*b*) Boil a double handful of bran in 1 qt. water; strain, and throw it into the water in which the dresses are soaking, and leave for 1 hr. For French linens, soak in a strong tea of hay before washing. For black goods, immerse in a solution of 1 teacupful of lye to a pailful of water. To starch, use thin glue, and iron on the wrong side.

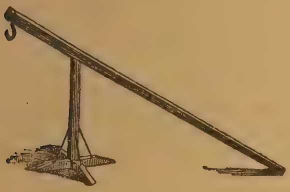
COUNTERSINK. Soften an old three-cornered file [*see* ANNEALING (*Iron and Steel*)], and grind or file the tang to fit a bit-stock. Break off 1 or 2 in. from

the end, and file to a diamond shape, as shown in the illustration. Then temper straw [*see* TEMPERING], and grind to a sharp edge.

COVERS: HOW TO CLEAN FURNITURE-. Without removing the covers, wash over with a flannel, and before they get dry sponge over with strong salt water, to every gal. of which 1 teaspoonful of ox gall has been added. Open the windows to dry.

CRANE: PORTABLE FARM. A portable crane can be made, as shown by the illustration, in any size. The standard rests on cross-pieces halved together, or on a square piece of 2 in. plank braced with iron or wood. The top of the post should contain an iron pin, which presses on hoop-iron let into the lever; or a hollow metal tube may be let into the lever, the pin passing through the tube being

fixed on to the standard. The lever must be bound on both sides of the tube to prevent it splitting. An iron



hook is fastened to the short end of the lever. The lever may be tapered from the pivot towards both ends.

CRAPE: HOW TO CLEAN. Wind the crape on a board, and steam it over boiling potatoes.

CURVES: HOW TO DRAW. Cut a strip of pewter about $\frac{1}{16}$ in. thick $\times$ $\frac{1}{2}$ in. wide, and the length of the longest curve required. Dress straight with a file, and smooth

with emery cloth. Draw the metal between the fingers, or over the thumb, till the required curve is obtained. For sharper curves use a lighter strip.

CYCLE CHAINS. If an open chain of a cycle creak whilst running, immerse it in paraffin, and after it has been thoroughly soaked, work it about till all the grit is loose, and then wash again in paraffin. Hang the chain up to drip and drain for a few hours, and then immerse it in melted goose grease or tallow for about an hour, working the joints now and again to allow the grease to thoroughly penetrate. Then allow it to cool, and when cold rub off the grease from the outside and apply graphite freely.

CYCLE: HOW TO CLEAN. Support the cycle so that both wheels may be rotated, and then squirt paraffin oil into all the bearings. Tilt the machine over towards one side, and rotate the wheels; keep on squirting in paraffin, and rotating the wheels till the paraffin runs out quite clear, when the bearings will be clean. Tilt the machine over to the other side, and clean the opposite bearings in the same way. Then oil up with oil of a good body, and rotate the wheels a little to work it in all over. The bearings need very rarely be taken apart. To prevent grit getting into the bearings in wet weather, tie wash leather strips or wool round the spindles at the sides of the bearings. Mud should, properly speaking, never be allowed to dry on the enamel; mud dried on should be first made soft with a sponge, and then dabbed, not rubbed, off.

CYCLE SADDLES: HOW TO SOFTEN. To stop saddles creaking, or to soften them, rub soft soap on the under side of the leather occasionally. A drop of oil placed on each spring where the wire crosses on itself, will often stop squeaking that is wrongly believed to be the leather.

CYCLE SPOKES: BROKEN. If a spoke be broken, it should be repaired immediately. When a new spoke cannot be obtained, bend the broken end of the spoke in the rim to a hook. Tie a piece of cord or wire in a loop round the hub, and pass the ends through the hole in the flange through which the spoke passed, if it be large enough. Tie the two ends of the cord to the hook in the rim; pass a piece of stick between them, and twist it round and round, thus tightening the cords, but care must be taken to twist it so that the strands of each cord are tightened—not loosened. When tight enough,

bind the wood to the next spoke to prevent it untwisting.

CYCLE WHEEL: HOW TO MAKE A TRUE. If a wheel be buckled, it can often be made fairly true, true enough to ride home on, by taking it out of the forks and placing it flat on the ground; then standing on the rim with one foot on each of the two high portions, and pulling the two low portions with the hands. The rim will then often spring back almost true. To fit a new rim, put in four spokes on one side equidistant apart, and four spokes on the other side as near opposite the first four as possible. Place the wheel in the forks and rotate it, holding a piece of chalk above the centre of the rim. Where the chalk touches the rim, slack out the nipples and take up the slack with the nipples diametrically opposite. When the rim is suspended very nearly concentrically with the spindle, put the other spokes in, and tighten all up together gradually. Then mark with the chalk at the sides as well as the top of the rim, and slack out a spoke or two on the side that the chalk mark is, and take up the slack by tightening corresponding spokes in between, coming from the other side of the hub, thus pulling the rim over to that side. Continue *gradually* getting the wheel true concentrically and sideways. Do not turn any nipple more than ¼ to ½ turn without spinning the wheel round, and testing with the chalk to see how it runs. If any small flats be noticed, let out the spokes slightly in the middle of the flat, and tighten those at the ends of it. When finished each spoke should be at the same tension, and if all of them be of the same gauge, this may be roughly tested by tapping them, when they should all emit the same sound. Avoid "dishing" the wheel, *i.e.*, pulling the rim as a whole more to one side than to the other. This may occur even when tested with the chalk. If the frame be made by a good firm, and the rim be in the centre of the forks, it may be taken that it is not dished. To test, hold a piece of twine diagonally through the wheel, when it should pass over the centre of the hub (the oil-hole is usually in the centre). If it does not pass over the centre, slack out all the spokes the same amount on one side, and tighten up the same amount on the other, thus bringing the rim bodily over.

DART. Make as for an arrow [*see* ARROWS], only feather heavier, and on two sides only. Point the end with a head not more than 1 in. long, and cut a notch at the balancing point inclined towards the head. Take a stick a little shorter than the dart, and tie on it a string 8 or 9 in. long with a knot at the free end. Place the knot in the notch, hold the dart in the left and the stick in the right hand, and throw. The stick and notch may be dispensed with by giving the string one twist round the dart near the base of the feathers, and then holding the string and the dart near the head. Throw in the ordinary way, and retain the string in the hand.

DELAINES: HOW TO WASH. Mix lukewarm water with white soap to a lather, empty it into the washing tub, and add 1 tablespoon-

ful ox gall. Wash the delaines in the suds as quickly as possible, but do not soap them; then rinse in a tub of cold water with 1 tablespoonful ox gall added; and then in two more rinsing waters with 1 teaspoonful of vinegar in each. Hang out to dry in the sun, and when nearly dry, iron. If the delaines be allowed to freeze when wet, the colours will be ruined.

DISINFECT CELLARS: HOW TO. Sprinkle pulverised copperas, chloride of lime, or common lime on the ground of a damp, musty cellar. For decaying vegetable matter, dissolve 1 lb. chloride of lime in 2 qts. water, and apply. As an absorbent, mix 1 part plaster of Paris to 3 parts charcoal, and sprinkle freely.

DISINFECT DRAINS, SINKS, ETC.: HOW TO. Flush the system thoroughly with one of the following liquids: (1) Dissolve ½ lb. copperas in 1 gal. water. (2) Dissolve 1 lb. chloride of lime in 2 gals. water. (3) Dissolve 1 bushel of salt in a barrel of water, and then slake lime with it, till as a thin wash.

DISTEMPERING. Mix best white Spanish whiting with water to cream, and set it away for 12 hrs. Then pour off the clear liquid, grind up a little lampblack and add it to the whiting. Warm up 1 qt. double size, strain, and mix 6 lb. of the prepared whiting with it. If any pigments are to be added, grind them up very fine and add them to the whiting. When mixed, set away to cool, when it should form into a jelly. Water may be added to it before use, but the thicker the jelly the better, if expense be disregarded. The size usually employed is only glue, double size being of extra strength, though parchment size is sometimes used. Distemper changes colour on drying, and it should therefore be applied to a piece of paper and dried in front of a fire to test. The amount required for the job should be mixed at one time, as it is almost impossible to match the tint afterwards. To check absorption by the walls, add 1 oz. alum and 1 oz. soft soap to the 6 lb. whiting. This is often known as "clear cole". 1½ lb. jelly will be required for every 10 sq. yds. super. Before applying rub down the wall or ceiling with sand-paper, and then brush away all dust. Close the windows and doors, and apply the distemper as quickly, but thoroughly, as possible. When all is finished, open the windows and doors to create a good draught to dry all together.

DITCHES. Where much water has to be carried off, open ditches are preferable to drains. Dig the ditch at the lowest portion of the tract, with a few wing sluices to wet places, and connect it to a pond, if possible. In clayey soil the sides of the ditch may be made nearly perpendicular; in sandy soils the pitch is often not less than 1 in 3. If the soil be loose, shovel some into a heap, and note the slant of the sides. Make the sides of the ditch of the same angle. [*See also* DRAINAGE (LAND)]

DOOR BOLTS. (1) Fig. 1 (*A*) is a lever pivoted, and attached to

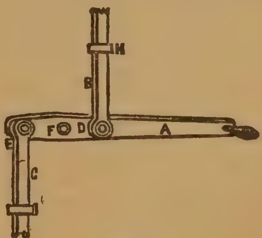


FIG. 1.

the door at (*F*). At equal distances from (*F*) two arms (*E*) and (*C*) are

pivoted at (D) and (E). Now when the handle at the end of (A) is raised, the arm or bolt (B) is raised, and the arm or bolt (C) is lowered. Two guides or staples are attached to the door to guide the arms into their slots for locking. The staple should be placed as near as possible to the slots for the bolts to lock in, but not so near that the bolts (B) and (C) will drop out when the door is unlocked. Make the lever (A) of hard wood about 1½ in. thick, and pivot it to the door with a ½ in. bolt; the arms (B) and (C) are of ½ in. iron, knocked out at the ends, and pivoted to (A) with ½ in. bolts. The slots

FIG. 2. FIG. 3.

for the bolts to lock in can be hollowed out of the wood at the top and bottom of the door. (2) Bend a piece of ½ in. iron as shown in Fig. 2, and weld a piece at the centre for a handle. Bend the two semicircles at (a) (a) and (b) (b) at right angles away from the paper, so that they will be as shown in Fig. 3. Knock three staples into the door as shown in Fig. 3, and drive pieces of ½ in. iron into the wood on top and bottom of the door-frame for locking pins. To close, twist the handle round, and thus enclose the pins in the loops at the ends of the rod. If the door be double, attach the bolts to the half which overlaps the other.

DOOR: CATCH FOR BARN-. Cut a piece of board as illustrated 5 in. long × 2½ inch. wide and screw it on to the floor where the door is to be held. For keeping the door open drive a staple

or screw a picture-frame ring into the door, and a hook and link into the wall.

DOOR: CRACKS IN. Open the door, place putty along the jambs, and cover the edges of the door with chalk. Shut the door, and the putty will be squeezed out where not wanted. Remove this putty and leave the rest of it to dry, and then paint.

DOOR: CREAKING. Apply oil to the hinges. If rusty, apply paraffin first and work the door till the paraffin is expelled, taking most of the rust with it; then oil with thick sperm oil.

DOOR: HOW TO RECTIFY A SAGGING. If the hinges be of the modern type, make washers of tin to fit the pin and insert them; if of the old type, wedge up the door to its proper position, take out the screws of the hinges and mark off the proper positions for them. Cut out the wood with a chisel, plug up the old screw holes and then screw the hinges up in the new position. If the door does not sag much, take out a little wood under the top hinge and put a washer of thin sheet metal under the lower one, and screw up. The bottom of the door should never be planed away.

DOOR: SLAMMING. Tack rubber or thick cloth on to the door-jam casing: 3 in. of material at top and 3 in. at the bottom is sufficient.

DOUBLE-TREE. For heavy work, split the double-tree from 2 in. oak or ash, 4½ in. broad at the centre and 3½ in. broad at the ends.

The length should be about $1\frac{1}{3}$ times the length of the whipple-tree. The holes for the clevises should be about 3 in. from the ends and bored as far back as the irons will allow. Make a staple to go through the centre from best Low Moor iron; the part that goes through the wood and the thread should be no more than $\frac{5}{16}$ in. diameter, but the back of the staple which has to take up the wear should be at least $\frac{1}{2}$ in. broad × $\frac{3}{8}$ in. thick. The staple is held in front by two nuts screwed down on to a $\frac{3}{16}$ in. plate, extending over both legs of the staple. The double-tree should be tapered towards the ends from both sides, and finished with oval edges and flat sides, excepting where the clevis is applied, and there the corners should be left on. [*See also* TRIPLE-TREE AND WHIPPLE-TREE]

DRAG: CROTCH. Select a tree crotch of hard wood, the branches being straight and about 8 in. diameter; the front should be worked up as the runners of a sleigh and tapered to a bluntened point. Make a long mortise through the head for the chain attachment, which should draw on

FIG. 1.

a short rod of iron or wood lying across the mortise. Pin a saddle-piece across the centre, and hollow a little in the middle as shown in Fig. 1. If a natural tree crotch cannot be found, select two pieces of wood with a slight curve, mitre them, and bolt firmly together with two carriage bolts and washers. For hauling barrels, pin on two

FIG 2.

saddle-pieces and hollow them out as shown in Fig. 2.

DRAINAGE: LAND. The main drains should be laid at the lowest parts, such as around the base of a hill or down a valley, the feeders draining the intermediate ground. As few angles as possible should be made in all drain work, and to those which are necessary give a long sweep, not a sharp angle. Care should be taken to avoid laying the drains too close to the roots of growing trees. All the net-work should be laid sufficiently deep in the ground to prevent water freezing in it even during the most severe winter, and with a fall of not less than 1 in. in 10 ft.

Board: (1) Dig a ditch 1 ft. wide × about 1ft. 6 in. deep, then at the bottom of it dig another ditch 6 in. wide × 6 in. deep. Cover the second small ditch by planks resting on the shoulders formed by the bottom of the first ditch and then fill up with brush, etc., as for a blind drain as shown in Fig. 1. (2) Nail three 1 in. boards 8 in. wide together in the form of a triangle, then put them in a ditch, from the bottom of which a small channel has been dug to receive them, sharp side down, and pack with coarse stones and rubble as shown in Fig. 2. (3) For very loose soil nail two boards together like an inverted V, and lay this on a bottom board.

Brush: Brush drains are most

suitable in stiff or clayey soil and least suitable in loose or loamy soil. They should not be employed to carry off water immediately after heavy rains. Dig the ditch 1 ft. wide at the bottom, and from 1 ft. 6 in. to 2 ft. deep. Fill the bottom 10 or 12 in. with good-sized brush well packed down, the tops pointing down stream. Cover with a plank, and then lay 3 or 4 in. of straw or leaves on the top, to prevent sand and mud working through. Fill up with stones and then earth; leave the top crowning, for the brush will settle down in the middle in time.

Pole: Where straight run trees and branches are easily obtained, the pole drain is very suitable. (1) Dig a ditch about 1 ft. 3 in. broad × about 2 ft. to 2 ft. 6 in. deep. Down one corner lay logs about 6 in. diameter, then lay small branches about 3 in. diameter, one end on the top of the logs, the other end lying in the opposite corner. Lay smaller branches horizontally on the top of these, then brush, the tops pointing down stream, and fill up as for a brush drain as shown in Fig 3. (2) Dig a ditch about 1 ft. 3 in. wide × from 2 ft. to 2 ft. 6 in. deep. Place logs about 6 in. diameter down one corner, and rest planks on these logs slanting down to the other corner in the same way as No. 1, only using planks instead of the smaller logs or branches. Fill up with brush and stones as for No. 1. (3) Dig a ditch about 1 ft. 3 in. wide × about 2 ft. 6 in. deep. Place logs about 6 in. diameter down each corner and rest planks on the top of them. Fill up with brush and stones as in Nos. 1 or 2.

Tile: Tile drains should be used in gardens for running under paths, etc., and are very suitable to work in connection with surface boxes. All surface boxes, which are used to drain surface water, should be built of brick, and be sufficiently large to be readily cleaned. At the top an iron grid should be fitted to prevent twigs, etc., from falling into the box; below the grid, but above the pipes, a sheet of stout perforated zinc should be fitted. The bottom of the box should be at least 8 in. lower than the lowest part of the discharging pipe, so that any sand or dirt which may fall through the grid and the perforated zinc will collect at the bottom of the box, and not be carried into the pipe. The boxes should be periodically cleaned out, and after each heavy rain-storm, if necessary. The pipes for feeders or branches should be 2-in. bore; the main pipes will rarely have to be more than 4

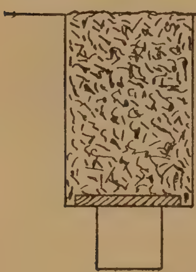


FIG. 1.

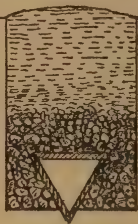


FIG. 2.

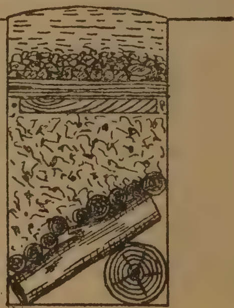


FIG. 3.

to 6 in. diameter. It should be remembered that a 4-in. main will easily carry off the water from five 2-in. branch pipes; a 6-in. main from ten 2-in. branch pipes. If the soil be soft, place boards under the pipes to support them. Place perforated zinc in front of each open pipe end, into which or from which the water will flow.

DRAWINGS: HOW TO FIX CRAYON. (1) (*a*) Dissolve purified gutta-percha in chloroform, and apply it with a scent atomiser over the drawing. A drawing thus protected can be washed in cold water, but the gutta-percha becomes sticky at about 150° Fahr. (*b*) Substitute gun-cotton dissolved in ether (collodion) for the gutta-percha solution in (*a*). (2) Dissolve 1 part gum-lac in 10 parts alcohol, and filter through animal charcoal. Apply sufficient of this varnish on the wrong side to soak through and fix the dust on the right side. (3) Mix 1 part skimmed milk with 1 part water and wash the pencil marks with the mixture, using a soft camel hair paint brush. Place on a flat board to dry.

DRAWINGS: HOW TO TRANSFER PENCIL. (1) Lay the paper to receive the copy on a drawing-board, put carbon paper on the top and cover with the drawing. Pin all three on to the board, and then go over the drawing with a style, or a darning needle with the point ground off. (2) Perforate the lines of the drawing with a needle, lay it on the face of another sheet of paper, and rub over with powdered black lead. Remove the drawing and join up the black points left on the paper with a pencil.

DRAWINGS: WORKING. Make out drawings for the proposed work to scale, if it be a large job, say $1\frac{1}{2}$ in. or 3 in. = 1 ft. With the leading dimensions given, the details can be put in by eye, and then scaled off, and so experimenting on the work itself may be saved.

DRILL: BOW. Make a bow about 12 in. to 18 in. long of elastic wood or whale-bone. On the drill have a pulley, and round the pulley give a cross-lap of the bow string. Support the drill under the ball of the forefinger, and move the bow backwards and forwards, thus rotating the drill.

DRILL: IRON. Draw the drill out from tool steel, as shown in the illustration, and temper the two cutting edges dark yellow. [*See* TEMPERING.] Sharpen the two

slanting sides to an angle of about 75° for iron, so that only the front edges touch the metal when the drill is rotated.

DRY-CLEANING. Dip a brush in warm gall, and apply it to the greasy places; then rinse it off in cold water. Dry before a fire, then strew damp sand over it, and beat it into the cloth with a brush. Now brush the sand out with a hard brush, and when all is removed rub a drop of olive oil on the brush and brush lightly.

Black: (1) Boil 2 or 3 oz. logwood in water for $\frac{1}{2}$ hr. The cloth being cleaned, dip it in warm water, and squeeze dry. Then dip it in the logwood water, and boil for $\frac{1}{2}$ hr. Take it out, add a small piece of green copperas and boil for another $\frac{1}{2}$ hr. Hang the cloth up in the open air for from 1 to 2 hrs. Rinse once or twice in cold water, and dry. Brush with a soft brush over which a few drops of olive oil have been rubbed. (2) Boil 2 or 3 oz. logwood in vinegar, and when the colour is extracted, drop in a piece of carbonate of iron as large as a chestnut, and let it boil. Sponge the cloth well with soap and hot

water, lay it on a flat board, and brush the nap down with a sponge. Sponge all over with the reviver, drawing with the brush in the direction the nap lies. When dry, dissolve 1 teaspoonful of saleratus in warm water, and sponge all over with this, to set the dye. Do not wring, but hang up to drain, and dry.

DUMB-BELLS. Cut four blocks of wood 5 in. cube, round the corners and edges, and bore a hole right through the centre. Fit handles about 8 in. long, 1½ in. into each cube, so that there will be 5 in. between the cubes. Pour lead into the other end of the holes till of the required weight, and then plug up the remaining space with wood.

DYE: ANILINE. Mix about 2 drs. aniline crystals in 4 oz. alcohol, and bottle. This will be sufficient for about 2 gals. dye. Pour out enough water just to cover the goods, and add a little sulphuric acid, if silk or wool (but alum, if cotton); just enough to give the water a slightly sour taste is sufficient. Now add a little of the bottled dye, and test for colour with a spare piece of silk. When the dye is of the required strength, rinse the silk in water, immerse it in the dye, and heat gradually till it boils. Make the rinsing water sour with sulphuric acid for silk and wool, but with alum for cottons. Where special instructions are printed on the wrapper, they should be carefully carried out.

DYE: BLACK. Boil a large kettleful of butter-nut bark for 4 hrs.; take out the bark, and put in a spoonful of copperas. The more copperas put in the deeper the black, but too much rots the goods. While the dye is boiling, put in the fabric, and keep stirring, and every few minutes lift the goods with a stick into the air, till the required shade is obtained. If left folded, or packed too tightly, the goods will become spotted.

DYE: HOW TO BRIGHTEN. For blues and purples mix soda in the rinsing water. For pink and green use vinegar in the rinsing water.

DYE COTTON: HOW TO. No acid should be used in the dye, but alum used instead. Acid sets the colours best, but rots the cotton.

Blue: Dissolve 1 oz. best Spanish indigo, 1 oz. sulphate of iron and 2 oz. quicklime in water. [*See also* DYE SILK (*Indigo*), and DYE COTTON (*Indigo*)]

Indigo: Mix indigo in water, soak the cottons in it, and dry. No mordant is required. This dye is also used for wool and silk.

Purple: (1) Immerse the cottons in a solution of oxide of iron. (2) Dye the cottons first blue, and then immerse them in a decoction of logwood.

Red: (1) Dip the cottons in a weak solution of alumina, dry at a high temperature, and then wash. Dip them in a hot solution of madder, and wash again. (2) Impregnate the cotton first with oil, then with galls, and then with alum. Boil it for about 1 hr. in a solution of madder, to which a quantity of blood may have been previously added. After the cloth is dyed, dip it into a soda lye.

Yellow: (1) Dissolve 9 oz. sugar of lead in 6 lb. water. Dissolve 6 oz. bichromate of potash in 6 lb. water. Make the goods wet, and dip them first into the sugar of lead solution, next into the potash, and then again into the sugar of lead. Wring them out as dry as possible, and rinse them in cold water. This gives rather an orange tint, which may be intensified by dipping the goods in strong lime-water. The quantities given will dye 6 lb. goods. (2) Mix 8½ oz. sugar of lead and 16½ oz. litharge in 3 gals. water, and heat it to boil-

ing—stirring all the time. Keep boiling about 10 mins.; leave to settle, decant, and while warm put in the bleached cottons. Dry by a fire slowly, and then dip the good into a solution of 8½ oz. bichromate of potassa in 4 oz. nitric acid and 3 gals. water. Wash them well in warm water, and then dip them in a bath of 2 drs. saffron dissolved in 1 qt. alcohol until the desired tint is obtained. This dye gives a golden chrome yellow tint.

DYE FEATHERS: HOW TO. Aniline dyes are good, with the exception of black, if the instructions on the wrapper be carried out.

Black: (1) French black. (2) Steep in a strong logwood decoction for 10 hrs.; then in a solution of 1 oz. bichromate of potash to 4 gals. water at 200° Fahr. for 1 hr. Repeat both baths, if the shade be not dark enough.

DYE FUR: HOW TO. Mix 1 qt. lye, in which an egg will float, with 2 qts. soft water, and heat in an iron kettle. Pulverise 1 oz. acetate of lead, 1 oz. sulphate iron and 7 oz. litharge, and dissolve one at a time in the lye. When the fluid is blood warm, put in the furs for a few moments; then air them, and dip in strong vinegar; shake them, and hang up to dry. If not dark enough, add more ingredients to the lye. [*See also* DYE SKIN (HOW TO)]

DYE GLOVES: HOW TO. *Black:* Steep 4 oz. logwood chips in 2 qts. water, and then add a little copperas and alcohol. Put the gloves on the hands, or on substitutes made of wood; brush over with the dye, and rub the hands together gently, until the gloves are dry. If not black enough, repeat. When the gloves have become chafed or spotted, add salad oil to ink and apply with a feather.

Colours: Almost any fast dye will do. Brush over the leather with the dye, and let it dry; repeat three or four times. Brush off the material collected on the surface of the leather, and when dry rub with a smooth stick, then wipe over with a sponge wet with the white of an egg.

DYE GRASSES: HOW TO. For ornamental purposes, dip the grasses, leaves, everlastings, etc., in an alcoholic solution of aniline compounds, and let them dry in the sun. The depth of colour can be altered by diluting with alcohol.

DYE: GREEN. Mix 1½ oz. oxalic acid with 1 qt. soft water. Mix 2 oz. Prussian blue in 1 qt. soft water. Leave the two solutions for 12 hrs., and then mix them together with enough water to cover the fabric. Put in the fabric, and leave for 20 mins.; then take it out, wring it, and dip it in the following yellow dye. Dissolve 6 oz. sugar of lead in 1 pt. hot soft water. Dissolve 4½ oz. bichromate of potash in 1 pt. hot soft water. Add sufficient water to each, and then dip the fabric first in the lead and then in the potash solution, and repeat dipping as often as necessary. The quantities given will be enough for about 4 lb. goods.

DYE LEATHER: HOW TO. *Black:* (1) Steep 2 lb. bark of elder, and 2 lb. iron filings in two gals. pure water; put in a cask and stopper firmly. After two months, press the liquid well out, and add 1 lb. powdered nut-galls and ¼ lb. copperas. Stir over a fire and press out the liquid. (2) Mix 1 oz. gum-tragacanth, 2 oz. ivory black, 2 oz. neatsfoot oil, 2 oz. deep blue prepared from iron and copper, and 4 oz. brown sugar in 4 oz. soft water. Evaporate the water, and form the blacking into cakes. To use, rub the cake over the leather, and polish with a cotton cloth.

DYE MOSS: HOW TO. Mix ½ oz. gum-arabic in ½ pt. water, and add 1 oz. chrome green, or any other suitable dye. Thoroughly wash the moss, and heat up, but

do not boil the dye, and immerse the moss in the hot liquid. When dyed, lay the moss out on paper to dry.

DYE: ROSE. Dissolve 1 dr. rose aniline in ½ teacupful alcohol and mix it with half a pailful warm soft water. Wring the goods out of warm water, and put in the dye, lifting the fabric frequently. Take them out, and dry them before washing, and use but little soap. If many articles of a required shade are needed, put them all in together, for the dye weakens rapidly.

DYE: HOW TO SET. Some mordants modify the colour of the dye; for instance, alum brightens madder to a light red, sulphate of iron darkens it to purple, etc. It is therefore best to always dye a sample before dyeing the whole.

DYE SILK: HOW TO. *Black:* Prepare the dye as in DYE WOOL (HOW TO: *Black*), using red oxide of iron, copperas, tannin, bichromate of potassa and logwood, the proportions to suit the quality of the silk. Logwood imparts a lustre and fulness to the black. Sulphate of iron can be dissolved in double its weight of cold water, but it is insoluble in alcohol. The silk when first dyed will often appear of an iron-grey colour, but it may be finished by stretching it out tightly and rubbing for about ½ hr. with a rubber of flannel slightly dampened with oil. ½ tablespoonful of sweet oil will be found sufficient for a pair of stockings.

Blue: To obtain different shades of Prussian blue, mix prussiate of potash, and chloride or sulphate of iron with water, adding more or less water to vary the shade. For deep shades, use acetate instead of chloride of iron. If the shade be light, and has a greenish tinge, wash well in river water; if the greenish tint still remain, dip the silk into a weak solution of hydrochloric acid. [*See also Indigo*, below; DYE (ANILINE), etc.]

Brown: Fill the kettle with river water; bring gently to a boil, and then add 4 oz. chipped fustic, 2 oz. madder, and 1 oz. sumac. Boil all together from ½ hr. to 2 hrs. Then pour the liquor into cold water, and put in the goods, and let them simmer for from ½ hr. to 1 hr. If the colour be too bright or light, add a little green copperas. Rinse in two or three waters, and hang up to dry.

Crimson: For light silk work, pour boiling water over a teaspoonful of cudbear, let it stand for a few minutes, then put in the silk, turn it over for a short time, and when the colour is deep enough, remove it. If it should require more violet or crimson, add one or two teaspoonfuls of purple archil. Dry indoors, and finish by pressing.

Flesh Colour: Wash the silk in clean soap and water, then rinse it in hot water. Mix 3 tablespoonfuls purple archil in a hand-basin half-full of hot water. Immerse the silk in the dye, and when it is half violet or lilac, remove it, and rinse slightly in cold water. Hang the silk up in a closed box, and light some sulphur in the bottom, so that the silk is suspended in sulphur fumes. [*See* BLEACH WOOLLENS.] When the silk is of the required tint, take it out and rub it on the right side with a clean flannel.

Indigo: Dissolve 1 oz. indigo in 4 oz. concentrated sulphuric acid, add 1 oz. dry carbonate of potash, and dilute with 3 lb. soft water. Wash the silk clean and boil it in water, to which has been added 5 oz. alum and 3 oz. tartar for every 2 lb. silk. After boiling a short time, take out the silk and drain it; then put it in a water bath, and add as much of the indigo dye as is necessary for the desired tint. The best way is to test the colour with a spare piece of silk. Rinse, stretch and iron.

Purple; (1) First dye crimson with cochineal dye (*see Scarlet*) and then dip in indigo dye. (2) Boil archil in water, immerse the silk quickly, let it cool, and then rinse in river water.

Scarlet: For silk shawls, etc. Dissolve 2 oz. white soap in boiling water; handle the shawl through this, till perfectly clean, and then rinse out in warm water. Dissolve ½ oz. best Spanish annatto in hot water, pour it into a pan of warm water, and handle the silk through this for ¼ hr.; then rinse in clean water. Dissolve a piece of alum, as big as a chestnut, in warm water, place the shawl in this for ½ hr., then rinse in clean water. Boil ¼ oz. best cochineal in water for 20 mins., dip out into a pan, and let the shawl remain in this for 20 mins. Take out the shawl and add 1 qt. more of the cochineal, and about ½ of a sherry wineglassful of solution of tin. Put the shawl in, and when cold rinse slightly in soft water.

DYE SKIN: HOW TO. Before dyeing, clean the skins—if the wool or fur be attached—with soap and lukewarm ammonia water. Then lay the mat out flat, and work the soap well in till the skin and fur is free from grease. Double the mat, skin side outside, and rinse in two warm waters. After dyeing, soak the mat in salt water for ½ hr.; then take it out, lay it on a table, and work out as much water as possible with some blunt instrument. Care must be taken in this last operation, as the skin will most probably be very soft and easily torn.

Black: Apply clear logwood water, and after the skin is dry, use copperas water sparingly.

Brown: (1) Boil 5 lb. oak bark, 4 lb. fustic, and 14 oz. logwood in water, and then strain. Having dipped the skins in the dye, dip them in alum water for a mordant. (2) Boil 5 to 6 lb. fustic in the dyeing vat, and allow it to cool to 100° Fahr., then add a solution of 2 oz. Bismarck. Immerse the mat and work with the hands for 20 mins. If not dark enough, add 2 oz. copperas to the dye, and handle till of the required shade.

Buff: Mix 5 parts whiting, and 2 parts yellow ochre to a paste with water; make it into cakes, and dry. Raise a nap on a dressed piece of leather with sand-paper, and then rub the powder from a cake thoroughly in.

Orange: Boil, and dip the skin in a solution of 3 oz. muriate of tin, and 4 oz. ox gall for 1 hr.; then add 2½ lb. fustic. Boil for 10 mins., and dip for 30 mins., then add a teacupful madder and dip for another 30 mins. 2 oz. cochineal may be substituted for the madder if a brighter shade be desired.

DYE: STONE-COLOUR. Boil 3 tablespoonfuls good green tea in sufficient water to cover 1 lb. fabric, and strain. Add and dissolve a piece of copperas as big as a chestnut in the liquor, and then immerse the goods, and boil for from 5 to 10 mins.

DYE STRAW: HOW TO. *Black:* (1) Immerse the straw in a boiling decoction of logwood extract for 4 hrs.; then take it out and air it till nearly dry. Add a little copperas to the logwood, and repeat the boiling, and allow the dye to cool down with the straw in it. After drying, dress over sparingly with olive or sweet oil on both sides, and press into shape. (2) Dip first in a solution of ferrous sulphate, and then in a strong decoction of nut-galls.

Green: Place the straw in boiling water for 10 mins., and allow it to cool. Meantime mix 45 grs. chloride of lime, and 45 grs. crystallised carbonate of soda in 1 qt. water. Immerse the straw in the clear liquid obtained by allowing it

to settle. Move about the articles thus bleached in a bath of 45 grs. hydrochloric acid to 1 qt. water for 5 to 10 mins., and colour the straw by agitating it in a bath of a solution of aniline green at blood heat, in a wooden vessel.

DYE VARIEGATED THREAD: HOW TO. Wind the cotton or yarn on a reel, and cover parts by tightly binding on parchment covered with tin foil. Dye the exposed parts, then remove the parchment, cover over the dyed parts, and dip into another dye, and so on.

DYE WICKER-WORK: HOW TO. *Black:* Brush well with hot lime water, and then rinse in clean water. Dip in a boiling decoction of logwood and gall-nuts, and then in acetate of iron, and finally paint with weak glue size.

DYE WOOL: HOW TO. *Black:* (1) Boil 3 lb. logwood, 1 lb. yellow wood, 1 lb. sumac and ½ lb. tartar in water till all the strength is extracted, and then strain. Boil the clothes in this; wring, and pass them through a liquid of ½ lb. sulphate of iron, and ¼ lb. sulphate of copper. This dye may also be used for skins, passing them through the two liquids alternately till of the required colour. (2) Boil in a solution of chromate of potash; then wring, wash and boil in a strained liquid made from 3 lb. logwood chips and 2 lb. fustic. Use warm and slightly acid rinsing water, and then wash. (3) Make a decoction from 5 parts nut-galls, and boil the wool in it for 2 hrs.; then mix 5 parts sulphate of iron, 30 parts logwood, and keep it at a scalding heat with the wool in it for 2 hrs. Frequently lift the goods to allow them to air; and if a little acetate of copper be added it will strengthen the colour. (4) Clean the wool with soap and cream of tartar. Mix 4 oz. bichromate of potash and 4 oz. crude tartar in a kettle of water. Put in the woollens and boil for 40 mins. Then take them out, and when they are nearly cool, immerse them in a bath made of 4 oz. logwood chips and ¼ oz. fustic chips in a kettle of water.

Blue: Dissolve 2 tablespoonfuls copperas in 4 gals. water; wet the goods in warm suds, and let them remain 10 mins. in the copperas water. Dissolve prussiate of potash in 4 gals. water, put the wool into this and leave for 5 mins.; remove and add to the potash water 1½ tablespoonfuls of oil of vitriol. Put the goods again into the dye, and let it come to a boil. Dry in the sun. [*See also Indigo*, below.]

Blue-Black: First dye Prussian blue, and then work the goods for ½ hr. in a decoction of 4 lb. logwood. Then add 1 oz. red chromate of potash, and work for ½ hr. more; wash and dry. These weights for 10 lb. goods.

Brown: For 15 lb. to 20 lb. goods, dissolve 1 lb. catechu and 4 oz. blue vitriol in 4 gals. water and strain. Make the goods wet, and put them into the dye for 1 hr. stirring constantly, then take them out to air. Dissolve 4 oz. bichromate of potash in enough hot water to cover the goods, and then dip them until the colour suits. Do the colouring in a brass or copper kettle.

Cochineal: Simmer 1 oz. cochineal, 2 oz. sulphate of tin, and 1 oz. cream of tartar with 4 qts. soft water in a brass kettle till dissolved. Immerse the wool, and let it simmer for ½ hr., stirring and lifting it into the air constantly; then wash in clean soap suds.

Crimson: Stir 4 oz. cudbear into 1 gal. strong soap suds. Wash the woollens in clean soap suds, and without wringing place them in the dye. Keep them hot in a brass kettle over a stove till they are of the required shade.

Indigo: (1) Powder ½ oz. Spanish indigo and pour over it ½ lb. oil vitriol; stir together and add a lump of pearlash the size of a pea. As soon as fermentation is ended bottle, and it will be ready for use in 24 hrs. Dilute the dye with warm water to the desired shade, wash the wool well, and after keeping it in the dye long enough, take out the fabric, dry it, and then wash it in lukewarm suds. Then rinse and hang up to dry. (2) Take 2 oz. best indigo, in fine powder, just sufficient water to cover, and 6 lb. of wool in the grease. Put the whole in a kettle large enough to contain all the wool to be dyed. As soon as the requisite colour is obtained, wash and dry the wool. The dye remaining may be used for lighter blues. (3) To dye blue a second time (*a*) dissolve 1½ lb. alum, 10 oz. cream of tartar and 6 oz. extract of indigo in 10 gals. water. (*b*) Boil 3 lb. logwood chips in 10 gals. water and strain. Wash the cloth in hot soap and water, and then rinse in clean cold water. Boil for ½ hr. in (*a*); wring out, and let it simmer in (*b*), which should be almost, not quite boiling, for 2 hrs.

Madder Red: (1) Soak 4 lb. madder in warm water for 12 hrs. in a brass kettle. Dissolve ½ lb. alum and ½ lb. cream of tartar in soft water, boil for 5 mins. and skim. Wet the articles to be coloured in strong soap suds and boil them for 3 hrs. in the alum and tartar water; then wring out and air them. Put the articles in the madder, warm over a slow fire for 3 hrs. and keep stirring; during that time wring and air them two or three times. The articles must actually be *in* the madder 3 hrs., the time in the air not counting. Finally wash the wool in soap suds and wring it out. These quantities will be sufficient for 8 lb. woollens. (2) Soak 1 lb. madder in enough best cider vinegar to wet it. Dissolve ¾ lb. alum in sufficient water, and boil the woollens in it for 2 hrs. Boil 1 qt. bran in 2 gals. soft water and strain. Add this to the madder; put it in a brass kettle, and fill up with sufficient soft water to cover the woollens. Bring to a scalding heat and put in the yarn, keep it hot for 1 hr. frequently turning the yarn. Take out the yarn and rinse immediately in cold water. These quantities will be sufficient for 2½ lb. woollens.

Orange: First dye scarlet, and then place the woollens in a yellow dye.

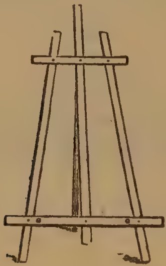
Red: For 5 lb. cloth mix 7½ oz. ground cochineal in 3 gals. soft water, and boil for 5 mins. Then add 10 oz. cream of tartar, and 1 port wineglassful muriate of tin. Throw the goods in, and handle them for ¾ hr., wash in clean water and dry.

Scarlet: (1) First boil the woollens in a solution of murio-sulphate of tin, then dye them pale yellow with oak bark, and afterwards crimson with cochineal. (2) For 1 lb. cloth mix in warm water ½ oz. cream of tartar and 1 oz. pulverised cochineal, then add 2 oz. muriate of tin. Stir until it scalds, and then put in the cloth. (3) Dip in a solution of alkaline or metallic salt, then in cochineal dye, and let it remain some time. (4) For 1 lb. cloth mix ½ lb. madder, ½ oz. cream of tartar, 1 oz. marine acid and bring to a scalding heat. Put in the material and leave for 10 mins.

DYE: YELLOW. Bruise 10 lb. young poplar twigs, and boil them in 3 gals. water for 20 mins. Filter hot and allow to cool, and then filter again through powdered resin. On exposure to sunlight this dye turns bright yellow, and may be used for any fabric.

EASEL. *Plain:* Cut three rods of white deal 6 ft. long × 1¾ in. wide × ¾ in. thick, and plane them up

square. Put them together by nailing, or screwing on two cross-pieces of the same width and thickness. Spread the bottom 20 in. apart, the top 12 in. apart, and in the bottom cross-piece put two



wooden pins for the picture to rest on, about 18 in. apart. Fasten a brace stick at the back to the centre bar of the same wood as the rest, but about 5 ft. long, with a light door hinge.

Rustic: For small pictures make as shown in Fig. 1 of slim shoots from a fir tree, with the buds full, dried in an oven. For the supports take two pairs and cross them at the top and two short ones going

Fig. 1.

from point to point at top, and four at the bottom making a square. As a hold for the picture above and below a second square bar is put. Fasten at all places where a cross is formed with brads. Figs. 2, 3 and 4 are illustrations of easels in rustic work, to serve as guides, which are easily constructed. Fig.

Fig. 2.

Fig. 3.

Fig. 4.

4 is the leg or brace to Fig. 3. Make from spruce or fir with the buds on. To hold the twigs to-

gether use brads. Two parallel sticks at the bottom are nailed on for the picture to rest on. The support should be attached, preferably hinged, to the top cross-piece.

EBONY: ARTIFICIAL. Steep dried rose petals or used tea leaves in just enough water to soften them, then add equal parts strong gum-tragacanth and gum-arabic and make to a thick paste. Add a few drops of oil of cloves or otto of roses and sufficient ivory black to colour, then macerate all in a mortar. This material very closely resembles ebony, and it may be cast and carved. It is also useful as a filler for ebony.

EGG-BLOWING. It will be necessary to have a drill and blowpipe before being able to blow the egg, and if the egg be hard set numerous small scissors, knives and tweezers will be required. These can be bought from any good naturalist. To make the blowpipe, nick a piece of $\frac{1}{4}$ in. glass tube about 10 in. long with a three-cornered file, and break off the length. Then hold it longways over an ordinary fish-tail gas flame, rotate it backwards and forwards

FIG. 1.

FIG. 2.

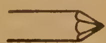


FIG. 3.

between the thumb and finger, and gradually insert it in the flame. When soft, bend it to the shape shown in Fig. 1. Let it cool, and then gradually insert it in the flame again, but this time across the flame, and when soft pull out to a point as shown in Fig. 2, and break it in half. This will make two blowpipes. To make a drill break 3 in. off a big steel knitting-needle, soften it [*see* ANNEALING (*Iron and Steel*)], and file the broken end to a six-sided point as shown in Fig. 3. Temper straw [*see* TEMPERING], and then sharpen it up on a hone. Hold the egg to be blown over a basin of water, so that if it be dropped it will not break, and make a small hole with a needle in the side which is least prettily marked. Then placing the point of the drill in this hole and resting the first finger on the top, rotate it backwards and forwards between the second finger and thumb. This should cut out a small and perfect circle in the shell as shown in Fig. 4, and the membrane hanging round the edge of it should be removed with a small pair of tweezers. Now, holding the egg hole downwards, blow through the blowpipe so that the fine stream of air impinges on one side of the hole, when the contents will "sizzle" out at the other side of the hole. If the egg be not quite fresh and the contents do not flow out freely, inject a little water into the egg with the blowpipe and shake it up to make all loose, then blow as before. If the egg be really hard set, the hole in the egg must be covered with five or six layers of pieces of thin paper cut to the shape shown in Fig. 5, the first piece being gummed on to the egg, the second gummed on to the first and so on till the egg shell is sufficiently supported round the edge of the hole. Then drill out a fairly large hole with a special sort of file drill, which should be bought, and cut up the contents of the egg through this hole with the special small knives and scissors, and remove the pieces with very small tweezers. The contents of the egg being now removed, inject water with the blowpipe till the egg is

half-full, shake it up and blow out again. Dissolve 6 grs. corrosive sublimate in 1 oz. spirits of wine, and half-fill the egg with this, using a syringe—not the blowpipe—as this mixture is an exceedingly strong poison. Shake up, and blow out again as before. Then stand the

FIG. 4.

FIG. 5.

egg to drain on a piece of white blotting-paper, the hole downwards. The outside of the shell should not be wetted more than possible, as water applied on the outside sometimes alters the egg's appearance.

EGG: CHICKEN IN. Put the eggs in warm water; those containing chickens will roll about, but those which are addled will lie motionless.

EGG: HOW TO PRESERVE. When eggs are kept separately, set them up small end pointing downwards; when packed in quantities in a barrel, turn the barrel over periodically, so that each egg first rests on the small and then on the large end. Barrels of eggs should in all cases be kept dry and cool. (1) (*a*) Grease the shell all over with fresh lard or butter. (*b*) Coat the shell with gum-arabic, and when dry pack in powdered charcoal. (2) (*a*) Strew a layer of some dry material, such as oats or dry sawdust, over the bottom of a box or barrel. Set a layer of eggs in this point downwards, and then completely cover with more oats; then set another layer of eggs as before, and so on till the box is full. (*b*) Substitute salt for the dry material. This is a very good preservative, but it tends to slightly harden the albumen. (3) (*a*) Place 2 in. salt on the bottom of a firkin, and then pack in fresh eggs point downwards till full. Slake 3 pts. quicklime in 6 gals. water, and add 2½ pts. salt. Leave to settle for 12 hrs., and then pour the clear liquid over the eggs. A few plates or a board should be placed over the eggs to prevent them floating. The eggs must be kept entirely under the brine, and if one break it must be removed, the old liquid poured off and fresh liquid added. (*b*) Mix ½ peck lime with 4 gals. boiling water, and when cold remove any lumps. Then add 10 oz. salt and 3 oz. cream of tartar, and mix thoroughly. Leave for a fortnight, and then pour the liquid over eggs packed as in No. 3 *a*. (4) (*a*) Dip the eggs in boiling water for ½ min., and store them point downwards in a cool dry place. (*b*) Mix equal parts alum and lime in boiling water and dip the eggs in for 10 secs. Store the eggs as for No. 4 *a*.

EGG-RACK. Nail four boards 18 to 24 in. long × 12 in. wide into a square open frame. Make four shelves to go into the frame ½ in. thick, and the same length as the sides. Bore the shelves with 1¾ in. holes, so that when the eggs are stood up in them, the shells just do not touch. The shelves can be grooved in or rest upon cleats, and no back or front is required. Place the eggs small end down, and keep the rack in a dry cool place. It may be hung by wire in an open space, or against a wall.

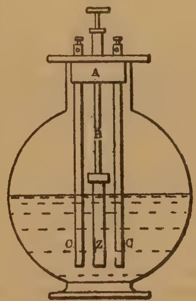
EGG: HOW TO TEST. *Hatching:* After the hen has been sitting 8 or 10 days, go at night with a lighted candle to the fowl house. Put the hand under the hen, and remove an egg. Shade the eye from the candle with the left hand, making a ring by bringing the thumb and forefinger together. Hold each egg against this ring so as to allow the light to shine through the centre of the egg. The eggs containing chickens will

appear dark, except for a clear space at the larger end. Those that appear as though filled with wax should be thrown away. Replace the good ones immediately.

Table: Hold the egg between the eye and the light, cutting off all rays of light with the hand except those passing through the egg, which should then be translucent.

ELECTRIC CELLS. The greatest difficulty experienced in making cells with a carbon plate, such as bichromate or Bunsen, is to secure a good electrical connection between the terminal and the carbon. This may be done by one of the following methods. (1) The most usual method is to cast a lead cap round one end. Mix ordinary yellow sand slightly damp, and make an impression in it, say $\frac{1}{4}$ in. broader each way than the carbon end, and $\frac{3}{4}$ in. deep. Make a few notches in the end of the carbon, and support it in the middle of the mould $\frac{1}{4}$ in. from the bottom. Pour in the molten lead, and leave it to cool. Then drill a hole in the top of the lead, tap it and screw in the terminal. Paint over the lead and 1 in. below on the carbon with Brunswick black. (2) Copper plate the top 2 or 3 in. of the carbon, and solder a piece of wire on. Cut a piece of copper to fit in the bottom of a salt jar, and solder it into a thick piece of copper wire 1 ft. long. Cover the copper plate with 1 in. of copper sulphate crystals, and pour in a solution of 1 part sulphuric acid to 10 parts water, to cover them over 2 in. Paint a band of paraffin wax $1\frac{3}{4}$ in. from the end of the carbon to prevent it being plated too far up, and immerse this end in the liquid, letting it rest on the crystals. Twist a piece of wire round the other end of the carbon, and connect it to the zinc plate of a Daniell cell. Connect the wire from the copper plate in the bottom of the jar to the copper plate of the Daniell cell, and leave for 2 or 3 days, replenishing the copper sulphate crystals, as they are used up. The top $\frac{3}{4}$ in. of the carbon should now be plated a bright red colour, and two small holes should then be drilled through the plated part. Run hot water through these holes till the carbon is quite clean; then dry, and then dip the end in melted paraffin wax till the wax rises and extends $\frac{1}{2}$ in. beyond the plating. (3) If the carbon be very hard it may be drilled and tapped, and the terminal screwed in direct. The end should then be placed in melted paraffin wax till the top 2 or 3 in. are saturated. Rolled zinc is better for plates than cast zinc. Zinc plates should in all cases be amalgamated. These should first be dipped in diluted sulphuric acid, and then mercury rubbed over with a small piece of flannel. The mercury will then combine with, and form an amalgam on, the surface of the zinc.

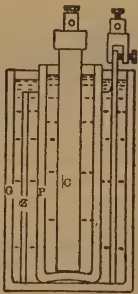
Bichromate: Two carbon plates (C) are hung, one on each side of a zinc plate (Z), in a glass jar. The zinc should be amalgamated, and is preferably fixed to a brass rod



(B) sliding in the wooden cap (A). When the cell is not in use the zinc should be raised out of the liquid by pulling the rod up. Mix 10 parts saturated solution of

bichromate of potash, with 1 part sulphuric acid, and pour it into the jar till it is about ½ in. from the top of the zinc.

Bunsen: A carbon rod (C) is placed in a porous pot (P), into which strong nitric acid is then poured till it is about 1 in. from the top. The porous pot is then



placed in a larger pot (G) made of glazed ware, and an amalgamated zinc plate (Z) bent to a cylinder, placed between the two, and the space then filled up with dilute sulphuric acid. The voltage from this cell is about 1·9. This cell is a modification of the Grove cell, the expensive platinum foil being replaced with a rod or slab of carbon. Chromic solutions, formed by adding strong sulphuric acid to solutions of bichromate of potash and soda, are sometimes substituted for the nitric acid in cells of this type. These cells are useful where voltage is required, as for an induction coil, but the objections to them are, that the acid gives off bad smelling gases, when in use, and they require a good deal of attention in filling up constantly with fresh acid, and keeping them clean.

Daniell: This cell is made from an outer glazed or glass jar (G) Fig. 1, which holds a piece of copper bent round in the form of a cylinder (C). Within the copper is a porous pot (P), which is preferably supported on an insulator, such as a piece of wood, and it contains an amalgamated zinc rod (Z), which should also be supported with wood, so that it does not touch the porous pot at all. Fill up the porous pot with dilute sulphate of zinc. At the bottom of the glazed jar 1 in. of copper sulphate crystals are strewn, and the space between the jar and the porous pot then filled up with a concentrated solution of copper sulphate. A modification of Fig. 1 is shown in Fig. 2. The outer jar is here made of copper, so that it serves the double purpose of holding the copper sulphate

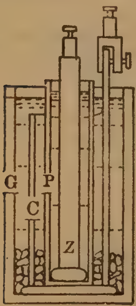


FIG. 1.

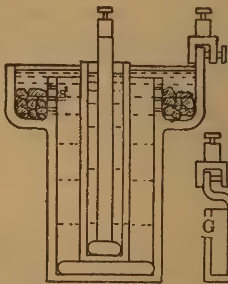


FIG. 2.

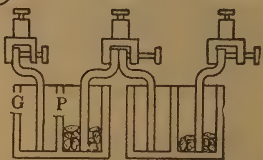
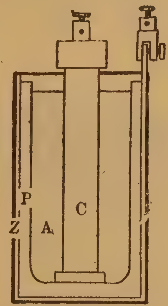


FIG. 3.

solution, and of the copper plate. A perforated copper shelf (S) is attached, in which copper sulphate crystals are supported. For the rest it is the same as Fig. 1. Fig. 3 shows the usual arrangement of cell as used for telegraphic work. A glazed pot (G) is made with a projecting strip (P) of unglazed ware in the centre, which serves the purpose of the porous jar. The copper sulphate solution, crystals and copper are placed in one partition, and the zinc and zinc sulphate in the other. This arrangement is used because they can be so readily grouped "in series". Neither the zinc nor copper should ever touch the porous pot below the surface of the liquid, for if it does, the zinc will most probably become coated with copper; this should be scraped off immediately it is noticed. The porous pot should not be very porous, and if the top and bottom be soaked in melted paraffin wax, it will prevent the acids from creeping, and sometimes the pot from cracking. These cells are often used for plating work, and should then be of a large capacity. For this purpose use the large glass covers sold for covering ferns, and cement them into a wooden bowl, cut approximately to shape, with plaster of Paris.

Dry: The outer zinc cylinder (Z) is best bought from the makers, but it may be made from sheet metal, and soldered up. Mix 5 parts plaster of Paris and 2 parts chloride of ammonium with 10 to 11 parts water, and line the zinc case ¼ in. thick all over with this plaster (P). After about 1 hr., place a piece of glass, vulcanite or fibre on the bottom, and then rest a carbon rod (C) on the top of it. Fill up the space between the carbon and the plaster to within ½ in. of the top with a mixture of 30 parts powdered graphite, or carbon, 4 parts manganese oxide, 2 parts chloride of zinc, 4 parts chloride of ammonium and 1 part glycerine in water to a thick paste (A). Seal the top with pitch, or equal parts pitch and resin, if the place in which the cells are to be kept is hot, and glue 2 or 3 thicknesses of brown paper over all. If



a dry cell be run down, drill a few holes in the top, and let it soak in a mixture of 1 part saturated solution of chloride of zinc and 2 parts saturated solution of chloride of ammonium. This may give good temporary benefit, but the cell will have to be recharged to benefit it for any length of time.

Leclanché: Insert a carbon rod or slab (C), which has previously had lead cast round the top for the terminal to screw into as explained before, into a porous pot (P). Break up and mix equal parts of sifted gas-carbon and black peroxide of manganese (M) from the size of duck-shot to the size of peas, and fill the space between the carbon and porous pot to within ½ in. of the top with it. Then pour melted pitch over till level with the top, and before the pitch solidifies, press a knitting needle through it in one or two places to allow gas to escape. When dry, paint all over the top with Brunswick

black. Place the porous pot in a glass or glazed jar (G) which also holds a rod of amalgamated zinc (Z). Mix 1 part concentrated solution of sal-ammoniac with 1 part soft water, and fill up the space between the jar and the porous pot with this liquid. Cells made on this principle are almost invariably used for electric bells, or for purposes where an intermittent discharge

is required, but the current soon drops if they be used for more than two or three consecutive minutes. The voltage of these cells is about 1·4. Dry cells are modifications of Leclanché cells, the space inside being filled with a spongy mass or plaster of Paris, in which sal-ammoniac solution remains.

ELECTRO-PLATE. The current used for depositing metals commercially is nearly always generated by a dynamo, which method is beyond the scope of this book. Electric cells can be, however, very successfully used, the principle being identical, and the only difference being that cells are rather more costly, and require more attention than the dynamo. Fig. 1 shows diagrammatically the way the cells are connected up. [Two cells (D) (D) Daniell cells are usually employed, so this cell is drawn] are connected "in series". The copper (C) of one cell is connected to the zinc (Z) of the other cell as shown, leaving a copper and zinc free. The free copper plate is connected by a wire to a ring suspended over a bath (P), filled with the plating liquid. Attached to this ring are sheets of the metal (called

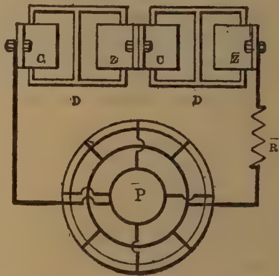


FIG. 1.

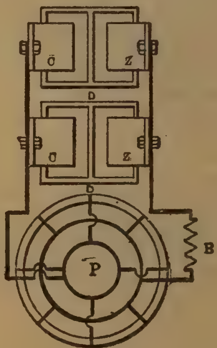


FIG. 2.

anodes), which are to be transferred electrically as a thin coating on to the articles as "plate". The free zinc is connected by a wire to another ring, which must be insulated from the first ring, over the plating bath, and the articles to be plated are suspended from it. If a variable resistance (R), such

as a carbon resistance, be placed in circuit as shown, it will be found exceedingly useful for regulating the current, and thus the rate of plating. After the article has become thinly plated, connect the cells in parallel, as shown in Fig. 2. Large Daniell cells of the same size are usually employed for depositing copper from its sulphate solution, and for silver plating; Bunsen cells for depositing copper from its alkaline solution, and for nickel plating. If electric light be laid on to the house, the current may be taken from the mains, regulating the amount taken by placing lamps of different sizes in series in the circuit, and by this means cells done away with. The cells should be tested with a voltmeter every few hours, and if the cell has ceased to act, it should be taken to pieces, and thoroughly washed. The zincs should be removed from the cell when it is not in use. To make the plating bath, make two rings of $\frac{3}{16}$ in. copper wire, and support them from the edge of a large cylindrical glazed jar. These two rings of copper wire must nowhere touch, nor have any electrical contact. It will as a rule be found most convenient to hang up the articles to be plated on the outer circle, and the anodes, or the metal to be deposited on the articles, on the inner circle of wire. The plating bath liquid is contained in this jar, and the articles to be plated must be completely immersed. Absolute cleanliness in making and keeping the plating liquids, and in keeping the plates, is essential. The articles to be plated should first be thoroughly cleaned as follows, but they should not be pickled longer than necessary, and the processes and then the plating must succeed each other immediately.

Copper and its Alloys: Boil 1 lb. caustic potash in 1 gal. soft water, brush the article, and then immerse it in the hot pickle for a few minutes. This solution attacks solder, so great care must be exercised if soldered articles be immersed in it. Rinse in running water. It will then be seen if the article be much oxidised, and if this be so, pickle it in a solution of 1 pt. sulphuric acid in 1 gal. soft water, until the dark parts vanish. Rinse in running water again, and then immerse in a solution of 1 oz. cyanide of potassium in 1 gal. water. Remove from the bath, and rub over with a scratch brush and pumice powder dampened with the potassium solution. Dip again in the potassium bath for a few seconds; rinse in running water, and transfer to the plating bath. If the article is to be gold or silver plated, immerse it for a few seconds in a mixture of $1\frac{3}{4}$ oz. mercuric nitrate in $1\frac{1}{2}$ oz. sulphuric acid and 1 gal. water. Then rinse, and place it immediately in the plating bath. If the articles to be gold or silver plated be free from any soft soldered joints, dip them in nitric acid for a few seconds till green; dry in hot sawdust and then place in the mercuric nitrate solution. To obtain a dead lustre, mix 2 lb. nitric acid (36°) with 1 lb. sulphuric acid (66°), $\frac{1}{8}$ oz. zinc sulphate and $\frac{1}{8}$ oz. salt. Immerse the article till slightly pitted; then rinse in running water, and then in the potassium bath. Rinse again, and plate.

Iron: Dip in a hot solution of potash in the same way as *Copper*. Rinse in running water, and then immerse in an acid bath, containing 1 per cent. sulphuric acid, for a few hours. Then rub with a scratch brush and pumice powder dampened with the acid; immerse again in the acid for a short time; rinse in running water and plate. Iron takes copper plate best, so that it should first be very lightly

plated with copper, and then plated with silver or nickel.

Steel: Dip in the potash solution; rinse, and scour with a scratch brush and pumice powder as for *Copper.* Then immerse for a short time in a mixture of 1 lb. hydrochloric acid in 1 qt. soft water; rinse, and then plate. Steel should be first copper plated as in the case of *iron.*

Zinc, Tin, Lead, etc.: Dip for a few seconds in a potash solution; rinse, and immerse in a solution of 1 part sulphuric acid in 10 parts soft water for a few minutes. Then rub with a scratch brush and pumice powder dampened with the dilute acid; rinse and plate. In the case of lead the acid bath may be omitted. First coat with copper as in the case of *iron.* If an article is to be replated, the old plate must be stripped off by emery cloth, acid or by some other suitable method, and then cleaned, and treated as a new article. A good way is (*a*) place 2 parts water in a stoneware or lead jar, and *slowly* add 8 parts sulphuric acid, stirring all the time with a glass or vulcanite rod. Then add 2 parts commercial nitric acid, and thoroughly mix. (*b*) Dissolve 1 lb. caustic potash in 1 gal. soft water. Rinse the article in (*b*); then in water, and then in (*a*). Keep lifting the article out of (*a*), and immediately the plate is stripped off, rinse in hot water, and then dry in boxwood sawdust. Do not strip the plate off by reversing the current in the plating bath, for the plating bath will then be most probably spoilt. If the articles to be plated are bright, the plate as a rule will be bright; if rough, the plate will appear dead. To take metallic impressions from an article, dust the side to be copied over with black lead, and smear the other side with grease. Hang it up in the plating bath, and plate in the ordinary way, and when thick enough, the plate may be readily removed from the article, and an exact inverse image obtained. Repeat the operation on this half mould, and an exact reproduction of one side of the original will be obtained.

ELECTRO-PLATE: COPPER. The articles to be copper-plated should be thoroughly cleaned and pickled [*see* ELECTRO-PLATE], but no interval of time should elapse between the various processes. To make the bath dissolve 1 lb. copper sulphate in 2 qts. hot strained rain water, and set aside to cool. Then add liquid ammonia *slowly*, and stir with a piece of wood. A green precipitate will at first fall in the form of mud, but on the addition of more ammonia it will begin to redissolve. Add ammonia till this precipitate is all just dissolved, and a clear blue liquid is formed. Then add a solution of cyanide of potassium in water to it, till it assumes the colour of good heavy ale. Try by experiment if this bath plates satisfactorily, and if not add more water. Use electrically plated anodes, such as the coppers from old Daniell cells, or copper that is absolutely pure, and have a *slightly* larger area of anode than area to be plated. Only a very thin film is required on iron, etc., as a foundation for nickel- or silver-plate. When this film has been plated, brush all over with a scratch brush to see if it adheres firmly all over. If some pieces flake off, scour these parts with whiting and water, rinse, and replate, placing an anode close to each bare patch. When the plating is good, rinse, and place it in the nickel- or silver-plating bath immediately; or the copper-plating may be first burnished, then dipped in a solution of 1 oz. cyanide of potassium in 1 gal. water, rinsed, and then placed in the silver- or nickel-plating bath.

ELECTRO-PLATE: NICKEL. Commence with two 2 gal. Bunsen cells in series, and after a thin coating of nickel has been plated, work the cells in parallel. If the article to be plated has been washed in an acid or potash bath, great care must be taken to rinse it thoroughly before introducing it into the nickel-plating bath. If the article to be plated be previously burnished, the plate will only need buffing at the end; but in no case should the scratch brush be used. To make the bath: (1) Dissolve commercial nickel in nitric acid, and pass a stream of sulphuretted hydrogen through to throw down impurities. Filter, and then throw down a precipitate with carbonate of soda. Thoroughly wash the precipitate thus formed (carbonate of nickel), and then dissolve it in dilute sulphuric acid. Place this solution under a bell jar over concentrated sulphuric acid, when dark blue crystals will be formed. These crystals should be ground up with sufficient ammonia to dissolve them, and the dark blue solution thus obtained used in the bath. Double sulphate of nickel and ammonia crystals may be bought from any electro-plater. They should be of a clear sea-green colour. Dissolve 1 lb. crystals in 1 gal. rain or distilled boiling water, and strain; pour this liquid into the plating bath, and test by experiment if more water should be added. This bath is nearly always used, and is perfectly reliable if clean and good materials only be employed. (2) Dissolve 1 oz. nitrate of nickel in 1 oz. ammonia, and then add to this mixture 25 times its volume of bisulphide of soda. Mix 6 parts sulphate of nickel and 3 parts ammonia in 100 parts water, and when the nickel is dissolved add 20 parts ammonia. Use this bath at 100° Fahr. Just before an article is transferred from the copper to the nickel bath, begin to plate some small odd piece of work, so that immediately the article is placed in the nickel bath it begins to get plated. The surface of the anode should be a great deal larger than the surface to be plated, but if too large the deposit will be in a fine black powder. When the article has been plated sufficiently, lift it out of the bath with wires, quickly rinse it in hot water, and dry it in hot boxwood sawdust. If the plating be good the article when lifted out of the bath will appear creamy-white, but if poor it will appear greyish-white. If the plating be poor, add 1 to 2 per cent. common salt to the bath and leave for 12 hrs. The plated article should be finally polished and buffed first with leather and tripoli, then with a calico mop and rouge composition, and then with swan's down and rouge. Iron, steel and zinc should have a very thin coat of copper before being nickel-plated.

ELECTRO-PLATE: SILVER. Commence and continue all through with one Daniell cell or more in parallel. The surface of the silver anodes immersed should be slightly larger than the surface of the article to be plated. If the anodes become pitted, immerse them a little deeper, so as to give a larger surface. (1) The usual bath is made from the double cyanide of silver and potassium. Dissolve 8 oz. silver nitrate in 1 qt. distilled water in a glass jar. Dissolve 3 oz. cyanide of potassium in ½ pt. distilled water, and add it to the silver solution drop by drop. A thick and spongy-white precipitate will be formed, and this precipitate will continue growing up to a certain point and then begin to dissolve again. Immediately no more precipitate forms stop adding the potassium solution. The quantities given are approxi-

mate, and a little more or less than ½ pint potassium solution may have to be added. Note how much potassium solution was added, and make up some more of the same strength and ⅛ more than the original amount. (For the proportions given before 3½ oz. cyanide of potassium dissolved in $\frac{8}{10}$ pt. water.) Leave the white precipitate for about ½ an hour to settle, and then pour off the clear liquid. Fill up with distilled water, stir up the precipitate and leave it again to settle, then pour off the clear liquid as before. Repeat this two or three times till the precipitate is thoroughly washed, and finally leave the precipitate as dry as possible. Now add the second amount of potassium solution, which should dissolve all the precipitate, and strain through calico. Then dilute with distilled water to the required strength, which is best found by experiment. If the anodes become slimy or dull add more potassium solution. (2) Dissolve 3 or 4 oz. cyanide of potassium in 1 gal. soft water, and pour it into the plating bath. Hang up the silver anodes and connect them to the positive pole of the battery, and connect a thin sheet of brass to the negative pole and hang it up in the bath. After some considerable time the brass will begin to be plated and the bath is then made. (3) Dissolve 1 oz. silver in nitric acid, and then evaporate till crystals begin to form; then mix with 3 pts. distilled water, and add a solution of caustic potash till no more precipitate is formed. Wash this precipitate as explained in No. 1, and then mix it with 3 lb. yellow prussiate of potash in 1 gal. soft water, and warm till dissolved. Finally leave to cool, and filter through calico. The plated articles may be scratch brushed, though this should not be necessary if the article be first thoroughly polished, and then polished with leather in the same way as nickel-plate [*See* ELECTRO-PLATE (NICKEL)] To plate cups, first silver-plate all over and thoroughly dry. Then fill up to the brim with gold solution (which is best bought); hang a gold anode up in the liquid, and connect one wire from the battery to it and the other wire to the stem of the bowl.

ELECTRO-PLATE: TIN. To make the plating bath, dissolve 12 oz. potassium pyrophosphate and 4½ oz. protochloride of tin in 20 oz. water. The plated article may be finished with the scratch brush. [*See also* TINNING]

EMBROIDERY PATTERNS: HOW TO COPY. (1) Copy the pattern on paper, or trace on tracing-paper and prick through the lines. Mix 3 parts finely-powdered charcoal and 1 part resin. Tie up in muslin, place the pricked pattern over the fabric, and shake the muslin bag over it. Remove the pattern, and the dots will outline the pattern. Cover these dots carefully with blotting-paper, and iron to fix. If the cloth be black use chalk instead of charcoal. (2) Mix finely-powdered sealing wax in alcohol till it will not dissolve any more, and bottle it up. Dip a pen in this liquid, trace the pattern off on tracing-paper, and leave it to dry. Put the tracing-paper, marked side down, on to the cloth and iron. The sealing wax will melt and stick on the cloth.

EMERY WHEELS, TRUE: HOW TO MAKE. If a wheel be dished, place it in a hot oven, or on a hot slab till it becomes thoroughly flexible. Then place it on a flat slab, convex side upwards, and weight it down in the centre. Test if it be flat with a straight edge, and if not, place another slab on the top, and press it down. When flat, fix it on a lathe while still flexible, and rotate it till cold and hard.

ENAMEL CYCLES, ETC.: HOW TO. Take the machine to pieces, so that the frame, front forks and wheels are separate, and detach the handle-bars, brake, seat-pillar and cranks. Scrape off all the old enamel if the machine is being re-enamelled, and insert wooden plugs into the tube holes, so that the parts can be lifted by them without touching the parts with the hands; the plugs also prevent the enamel trickling down into ball races. Polish with fine emery cloth, then with pumice powder and water on a flannel and then dry thoroughly. Apply a coat of quick-drying enamel with a camel-hair brush, working the brush only in one direction. Place the parts upside down to dry, so that any dust which may fall on it will not affect their appearance when placed in their ordinary position. When the enamel is quite dry, say after 12 hrs., rub down lightly with fine well-worn emery cloth, remove the dust, and apply a second coat of enamel as before. Dry as before, then rub down very lightly, dust and apply a third coat. Leave this coat say 24 hrs. to dry, and then rub down with powdered pumice stone and water on a flannel. When of a uniformly dull appearance, wash off the pumice, dampen a piece of flannel with olive oil and rotten stone or tripoli, and rub lightly till the surface begins to come up. Then rub with soft silk and dry rotten stone or tripoli, then with silk alone, and finally with the palm of the hand.

ENGRAVINGS: HOW TO CLEAN. Soak the engravings in a clear, weak solution of chloride of lime till white, and then soak them in running water. Steep for ½ hr. in a weak solution of hyposulphite of soda, and then dry between white blotting-paper under pressure.

ETCH GLASS: HOW TO. The process of etching glass is precisely that followed in etching metals [*see* ETCH METALS (HOW TO)], the difference being in the inks and the grounds. The etching ground, sometimes called "resist," should be of a more greasy texture than that used for metals. To make the ground: (1) Boil in a glue-pot 1 lb. beeswax, and ¾ lb. Russian tallow. (2) Boil in a glue-pot ½ lb. beeswax, ½ lb. Russian tallow and 1 lb. Japan wax. (3) Boil in a glue-pot 5 oz. beeswax, 1 lb. Russian tallow, 1 lb. Japan wax and 8 oz. Burgundy pitch. Make the glass so hot that it can only just be held in the hand; then dip it in the molten ground, and set it up on one edge for the ground to drain off, and solidify.

To make the ink. (1) Hydrofluoric acid. This is almost always used. If the hydrofluoric acid be run out into a flat lead dish, and the glass placed as near to it as possible, and exposed to its fumes, the unprotected portions will become frosted, appearing like ground glass. Shaded glass may be obtained by protecting it with coatings more or less impervious to the fumes. If the glass be placed in the acid it will be cut clean. (2) Mix 3 parts barium sulphate and 1 part ammonium fluoride in enough acid to bring it to a thick fluid ink. These inks must be kept in lead or gutta percha receptacles.

ETCH METALS: HOW TO. A few scribers are necessary, made from spring steel $\frac{3}{16}$ in. diameter, sharpened to long sharp points, and the points then rounded off to varying degrees of bluntness, the finest being just so fine that it will not catch in the metal to be etched. Prepare one or two similar scribers from ivory. A shade should also be made by bending a piece of No. 10 B.W.G. brass wire 3 ft. long into a circular form which should then be fixed into a small wooden

stand, and covered with tissue paper.

To make the etching ground: (1) Melt 1 oz. virgin wax in an iron pot over a slow fire, and then add ½ oz. Burgundy pitch; when mixed, add 1 oz. finely-pulverised asphaltum gradually, and then pour out to solidify in moulds. (2) Beeswax. (3) Paraffin wax.

To make the etching ink: *Copper and its Alloys:* (1) Mix 1 part nitric acid pure or with 1 to 3 parts water. This ink is usually employed, but hydrochloric or sulphuric acid is occasionally substituted for the nitric acid. (2) Dissolve 3 oz. potassium bichromate in 1 lb. hot water, and then add 4 oz. sulphuric acid. This etches sharper lines than the nitric acid, but takes longer. (3) Mix 5 oz. concentrated hydrochloric acid in 2¾ lb. warm water, and then dissolve in it 1 oz. chlorate of potash.

Iron and Steel: Mix equal parts sodic chloride and sulphate of copper. This ink will take 24 hrs. to etch hard steel, and a shorter time for soft steel or iron.

Zinc: Mix 1 part sulphuric acid with 10 parts water.

Clean the metal with fine emery cloth, and then with whiting and leather. Dip it in dilute acid, when it should turn dark all over, but if some places remain bright, these places are greasy, and they should be cleaned. The metal, being now free from grease, should be washed in running water, and dried. (1) Heat the metal sufficiently to melt one of the waxes; press the wax on, and spread it evenly over with a camel-hair brush; then place the metal on its edge for the wax to drain off and solidify. When dry, set the metal down on a flat surface, waxed side up; set the tissue shade in front, and draw in the design with the steel scribers, using the thick and thin points as required, and brushing off the particles of dust as they are formed with a small soft paint brush. If the design is to be traced, use the pitch, wax and asphaltum ground No. 1. Rub the back of the paper on which the design is printed with powdered chalk; lay the paper, chalk side down, on the etching ground, and go over it with an ivory scriber. The design will then be found marked in white on the dark ground, and the steel scribers are then used as before. If the design be fairly small, the ink may be dropped on; but if it be big, walls of wax or asphaltum varnish should be built up round the edge, and the ink flooded all over the surface. When the lightest lines are etched deep enough, pour off the ink, and rinse the metal in water carefully; then paint over these lines with a stopping of lampblack and Venetian turpentine, and then flood with ink again, so that the exposed lines are etched deeper. This may be repeated over and over again, painting over a portion of the lines each time to get varying depths of etching. Then wash thoroughly, and remove the ground with turpentine. (2) Another method not so commonly employed is as follows: Mix 5 parts saturated solution of beeswax in turpentine, and then add 1 part Japan varnish for the ground. Apply a coat of this to the cleaned metal, and leave it to dry for 12 hrs. Apply another coat, and while still wet smoke it by holding tapers underneath, and then allow it to dry. Then scratch those parts first which are to be etched deepest with the scribers, and immerse in the ink for 1½ hrs. Then scratch the next deepest lines and immerse for 1 hr. Then scratch the next lines and immerse again; and so on till the full design is in. (3) To etch a frosted background with plain design: Dissolve resin in alcohol, dip the metal to be etched into it,

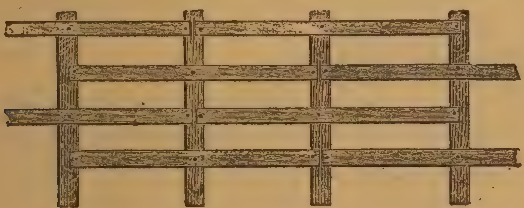
and hang up to drain and dry. On drying, the resin will crack up into numerous minute fissures. Paint the design over the resin crystals with Brunswick black, and when the paint is dry, flood with the ink. The acid will eat in between the small crystals, and give the background a very good frosted appearance. The design may be partially etched by two applications of ink, painting the design in between.

Instead of this method, steel or iron may be frosted direct by immersion in one of the following, the design having been previously painted in with Brunswick black, varnish, wax or tallow: (1) Mix 1 part concentrated nitric acid and 1 part water. This gives a good, but not very permanent frost. (2) Mix 1 part concentrated nitric acid, 2 parts acetic acid and 3 parts water. This gives a more permanent frost than No. 1, but has not quite such a good appearance at first. (3) Mix 1 oz. sulphate of copper, ½ oz. alum, 1 teaspoonful of salt, 4 to 8 oz. vinegar and 30 drops nitric acid. This ink makes a very permanent background, and it can be varied by adding more or less vinegar.

FEATHER-BEDS: HOW TO CLEAN. (1) For beds which only have occasional use, give a thorough beating and airing on a warm, sunny day. (2) For ordinary wear, take out on the grass, and wash over with hot suds, without wetting the feathers more than necessary. Then sprinkle 2 to 4 pails of water over with a watering-pot. Dry in the sun, and shake frequently. A spring shower is a very good renovator. (3) If fairly thin, immerse the bed in hot water, and clean. The bed must be frequently shaken and stirred to prevent mildew. To empty the tick of the feathers and then wash is very rarely necessary.

FEATHERS: HOW TO CLEAN. To clean feathers, dissolve 4 oz. white soap in 2 qts. hot water, and immerse the feathers for a few minutes; then remove them by holding the quill with one hand and drawing the feather through the other hand over and over again till the feather appears clean. If the feathers be rather yellow, add washing blue to the suds. Place the feathers lightly in a cardboard box in front of a fire, and shake the box occasionally whilst they are drying. If the fronds are to be curled, just before they dry draw them over the edge of an ivory paper-knife, pressing them down gently with the thumb.

FENCE: BOARD. (1) The boards should be nailed on to the posts so that they break joints, as



shown in the illustration. Cut the boards about 6 in. wide, and nail the lowest about 3 or 4 in. from the ground. If the fence is to be exceptionally high, the top tiers may be made of wire. [*See* FENCE (WIRE)] (2). The bottom board

may be nailed on 15 in. above the ground; then two furrows thrown towards the fence on either side, the first against the fence, the second furrow thrown on the top of the first, which will raise a bank nearly to the bottom board.

FENCE: BRUSH. Space the stakes 3 or 4 ft. apart. Have them 6 ft. long, and drive 1 ft. into the ground when it is wet. Use brush cut from trees, or better still, hedge toppings. Build up at the starting-point, then set the brush, heeled in, at an angle of 45°, and keep that angle all along, making no change when passing stakes. Straddle the stakes with cross laps and brading, and carry to the desired height. Top the brush once every three years.

4 in. for the rails. The rails are cut slanting at the ends, so that when two ends are driven into one mortise from opposite directions they are wedged in. A support 1 in. × 3 in. × 5 ft. is sometimes nailed on in the middle, as shown in the illustration.

FENCE: HILL-SIDE. In making a board or similar fence up the side of a hill, begin at the bottom, and nail the boards to the posts, placing the end of the first board under the end of the second in each tier, so that each separate board is as horizontal as possible.

FENCE: HURDLE. (1) Cut 3 boards 1 in. × 6 in. × 12 ft. for each section. For the cleats or uprights cut boards 1 in. × 6 in. ×

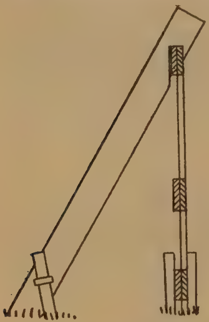


FIG. 1.

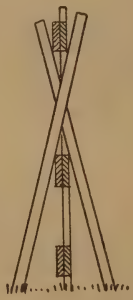


FIG. 2.

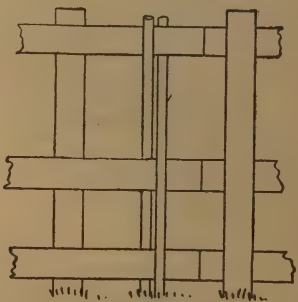
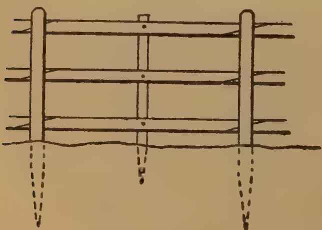


FIG. 3.

FENCE: FIELD. Cut lengths of 1 in. wood 4 in. × 8 ft. Cut the

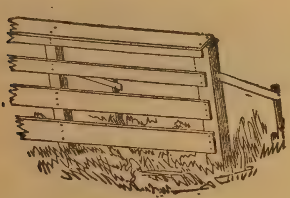


posts from 3 in. wood 4 in. × 6 ft., and mortise out three holes 1 in. ×

4 ft. Nail one of the uprights in the middle, and one 8 in. from each end of the boards. When the sections are set up, the ends should lap by each other, and the sections should be held together by driving cross stakes [*see* FENCE-STAKES] between the top and middle boards, where two sections lap, as shown in Figs. 2 and 3. (2) For sheep pens have the supports from the outside alone. Use one brace only, and cut a notch in it as shown in Fig. 1. Drive in a large staple about 6 in. from the bottom. Slip the notch in the brace over the top

overlapping boards of two sections, and drive a stake through the staple. Drive two stakes on either side of the lowest board in each section where they lap.

FENCE: MARSHY LAND. Where liable to floods, build a board fence [*see* FENCE (BOARD)], and brace from the posts as shown. About 3 ft. behind the posts drive in stakes; let them be 1 ft. above the ground, and spike braces from them to the posts. If



the ground be swampy, set the post while very wet. Sharpen the lower ends of the posts, thrust them in as far as possible, work sideways, lift and force down again till far enough in, then pack round on the surface.

FENCE: PICKET. Set the posts in the ground 6 ft. apart; spike a scantling 2 in. × 4 in. on to the tops of the posts, and let it project ½ in. beyond the front surface. 12 in. from the ground let another scantling into the posts sunk 1½ in., so that it also projects ½ in. Saw lengths of 1½ in. × 1½ in. pine for the pickets. Space 3 in. gap, and let them reach to within 3 in. of the ground. Nail with heavy wrought iron nails. If the ground be uneven with small knolls and hollows, saw off the top of the pickets level. If there be a gradual swell, the pickets should be cut to length before nailing on.

FENCE: POLE. The pole fence can be made of poles, either whole, halved or quartered, depending on the thickness. Build up at the starting-point to the height

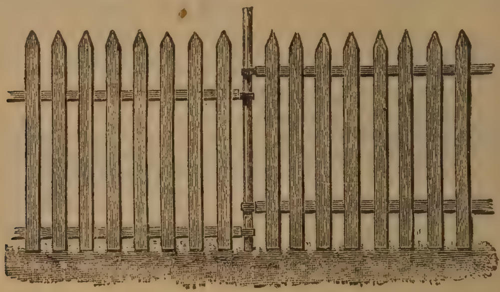
required, and then rest poles on crossed stakes, driving one end into the ground, as shown in the illustration. Nail in place, and clinch the nails.

FENCE: PORTABLE. For the rails or scantling use 3 in. × 3 in. deal. Saw off two lengths for each section say 9 or 10 ft. long. At each end of each rail punch holes, and screw on wide hoop iron

bent U-shape. For pickets use or ½ in. deal 3 in. wide. Nail on as illustrated, varying the rails on every other length, so that the picket, when in position, will rest

on the ground. Drive a stake about 2 in. square through the U-shaped hoop irons, as illustrated. To brace take a piece of 3 in. square deal, long enough to make a brace at 45°, and put on each end a U-shaped band, as on the rails, but

only using one screw on each side, so that the band will turn on the brace. Slip one of the bands over the stake, and through the other



end drive a stake into the ground. Cut the ends of the brace bevelling, so as to lie flush with the two stakes. [*See also* FENCE (HURDLE)]

FENCE-POSTS. The best posts are made from close-grained oak, or similar wood, cut while green, and well seasoned. If the wood be green do not paint it, but slightly char it, or tar the portion that will be in the ground, and about 6 in. above only. If the wood be seasoned, tar the post all over, and soak the end that will be in the ground in a kettle of tar. Some always set the posts in the ground top downwards, *i.e.*, the root end of the log in the air, and the branch end in the ground. This is an advantage if the wood be unseasoned, but does not affect thoroughly well-seasoned wood. To prevent the posts sagging cut beams of oak about 4 in. × 6 in. × 3 ft. 6 in. Cut a gain in the centre of each beam, the thickness of the post, and about 2 in. deep. Taper the bottom of the post slightly, and drive the beam on to it, then nail firmly in place. The posts should be set up so that the cross beams are at right angles to the line of fence. To remove old posts, hitch one end of a suitable chain to a team, and fix the other end on to the bottom of the post. A few feet away from the post put a prop leaning towards it, and pass the chain over; then let the team draw.

FENCE-RAIL. If rails be scarce, back-furrow a ridge 4 ft. wide upon the fence line. Set stakes in pairs 10 ft. apart and lay rails between. Hold the stakes by caps or pins at the top.

FENCE: REPAIRS OF. Where the nail holes have rotted large, draw out the nail, plug up the hole with wood and drive a new nail in another place. If the posts have rotted below the ground, saw off all the decayed wood. 4 in. from the end saw down ¾ in. deep square across one face. Cut off the piece partially separated, thus forming a half mortise, and nail into this a piece of 1 in. oak board 6 in. wide × 3 ft. 6 in. long, letting it project equally on both sides of the post. When the post is set upright, it rests on the edge of the board let in and is like an inverted T. Set it up between two sound posts, the oak board being let into the ground at right angles to the line of fence. If the posts have rotted through on the ground level, or below, drive in a 4 in. × 4 in. stake close up against the post till 1 ft. remains above the ground. Split down to the ground level and saw off the

half nearest the post, then nail the post in the gap thus formed. When the ground is wet, straighten up the posts with braces. Stamp the earth well down, and do not remove the braces till the ground is dry.

FENCE-STAKES. Use branches about 4 or 5 in. diameter, or well-seasoned hard boards 4 in. × 4 in. Make them 2 ft. longer than is necessary, and when they begin to decay at the surface of the ground, drive them in a few inches. To sharpen, put crossed stakes over a stump and pin them down to the ground. Lay the stake to be sharpened between them, and cut on to a cutting block. A crotched branch may be substituted for the crossed stakes.

FENCE: WIRE. Set the end post in the ground with a 2 or 3 in. oak pin through it near the bottom, projecting about 2 ft. in the line of the fence. If it projects under the fence, a solid bed must be made for it to rest on; if it projects away from the fence, heavy stones must be put on the top. The post must also be well braced with wire stays set at an angle of 45°. To keep sheep, etc. in, set the posts about 16 ft. apart, and bore $\frac{3}{8}$ in. holes for the wires to run through. For cattle run 5 rows of wire 8 in. apart, for sheep, 7 rows 6 in. apart, or the top 2 rows may be 8 in. apart. Unroll the coil of wire and draw through from the first post. When it has come to an end splice on another roll, and so on till about 40 rods have been unrolled, then splice the end to the first post and strain. To take the kinks out, loop the free end on to a hand-spike, stick the end of the hand-spike into the ground and lever the wire by pulling on the top end of the hand-spike. To strain the wire either of the two devices illustrated are good. Fig. 1 will strain about 80 rods of wire, 40 rods on each side. Fig. 2 will put on any tension required, and the length it will strain depends partly on the length of the bolt. To use this, splice the wire temporarily on the hook as tightly as possible with the nut on the end of the screw, screw down the nut, and if the wire be too slack jump on it between the posts, it will then be very slack. Screw the nut to the end, undo the splicing, rebind the wire, and then screw up again. Repeat this till the wire is tight enough. (1) To make the strainer as in Fig. 1, bend 3 ft. of No. 8 B.W.G. wire round, lap the ends 2 in., twist them together, and bend the ends back. Flatten down the wire till the sides are about 3 in. apart, take the two ends and bend the middle over a 2 in. stick making a sort of clevis. Make a 2 in. hardwood pin to work in the two loops, and shape the end to put a wrench on. Bore a $\frac{1}{4}$ in. hole through the middle of the pin to run the wire through. Bore a $\frac{3}{8}$ in. hole about $1\frac{1}{2}$ in. away from this, and drive in a $\frac{3}{8}$ in. rod 10 in. long. Splice one wire on the clevis, and pass the other end through the $\frac{1}{4}$ in. hole and fix there. Twist the pin round with the wrench, and when tight enough, lash the $\frac{3}{8}$ in. rod on to the wire to keep the wire from slacking out, and take off the

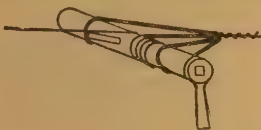


Fig. 1.

Fig. 2.

wrench. (2) The strainer as shown in Fig. 2 should be made from ½ in. to ¾ in. wrought iron, or mild steel. Bend the end to a hook, and screw the shank down with a stock and dyes. Put a big washer between the post and the nut. An ordinary long bolt can be used by chipping the head off flush with the pin on one side, so that the wire is not bent at a sharp angle when bound on. A tommy bar must be placed in the hook, when turning the nut to prevent the wire being twisted. (3) Another form of strainer is one on the principle of violin pegs. A bar of 1 in. iron is driven tightly through the post; the wire is fixed to one end, and the other end is turned by a wrench. The pin must be such a tight fit that the tension of the wire will not twist it round. To splice, lap the two ends 10 in., and twist together; then loop the ends back to prevent them drawing. Before cold weather all strainers should be slacked out a little. Stays must be attached to every post, to which one end of the wire is rigidly fixed.

FERNERY. Use a box 7 in. to 8 in. broad × 8 in. to 10 in. long × 4 in. deep. Into this slip four sheets of glass the size of the inside of the sides; crowd the earth well in, to keep the glass well in place; or they may be cemented in. [*See* CEMENT (AQUARIUM)] Place a sheet of glass on the top, slightly larger than the box. It is an improvement to have a zinc pan that will fit into the box after the glass is in. To make a better case, make after the style of an aquarium [*see* AQUARIUM], and cover with a sheet of glass let into the cap pieces. Cover the bottom with charcoal, then 2 in. best leaf mould, and a few broken pieces of flower-pots.

FILE: HOW TO CLEAN. For ordinary work in metal clean the file with a file card or scratch brush. Before filing mild steel rub the surface of the file with chalk. If clogged with lead or white-metal, rub along the cross-cuts with the end of a piece of wood. For wood files or rasps, damp the rasp and rub along the cuts with a piece of wood, using the end of the grain. Another way is to rub the rasp briskly, in line with the cuts, over a piece of woollen cloth drawn tight.

FILE: HOW TO KEEP. New files should be kept in sperm oil till required for use.

FILE, HOW TO RESHARPEN. If the file be badly worn, the only way is to have it recut; if only slightly worn it may be greatly improved by treating it with acids. (1) Mix 1 oz. sulphuric acid with 1 pt. water. Remove all grease from the file, immerse it in the acid, and leave it there till sharp; then rinse and dry. (2) Remove all grease from the file. Mix 1 part nitric acid to 8 parts water, and immerse the file for 25 mins. Add 1 part more nitric acid, brush the file under clean water, and then immerse it in the acid for 25 mins. more. Brush the file again under water. Add ½ part sulphuric acid to the solution, immerse the file for 3 mins., wash, and immerse again for 5 mins., keeping the solution in motion all the time. Wash the files, dry them, and then dip them in oil.

FILE PAPERS: HOW TO. Cut two pieces of cardboard, slightly larger than the journals. Bind them at the back with stout canvas, or thin leather, and leave it deep enough to accommodate 26 weekly, or 12 monthly, numbers. 3 in. from the ends, and ½ in. from the edge of the cardboard next to the back, punch holes large enough to admit a shoe string. Punch holes in the journals to correspond, and tie in over the back. If it be required to permanently fix the papers together, cut two strips of tin, and punch three or four holes through both. Place them on each side of

the papers along the back edges, bore holes through the papers, push pins through, and lightly rivet. [*See also* BOOK-BINDING]

FILTER: CHARCOAL-. Break up very small 10 parts coke, 20 parts wood charcoal, 30 parts animal charcoal, and mix with 40 parts short asbestos. Then mix with an equal weight of treacle, mould it into the required shape, and bake. When hard, soak it in dilute hydrochloric acid, wash, dry, and bake again.

FILTER: OIL- AND JELLY-. (1) Filter through a felted wool-bag. (2) Fit a lining made of a double thickness of flannel to a colander. (3) Pour the oil into a bottle, and then fit in a plug of white knitting wool as a cork. Turn the bottle upside down, and leave it to filter. [*See also* FILTER (CHARCOAL)]

FILTER-PAPER. Cut a piece of blotting-paper in a circle and fold it both ways across at right angles. It will then be made cupping when opened. Place it in a funnel, and pour the liquid through. Filter-papers, which are better than blotting-paper, can be bought at druggists.

FILTER: WATER- (1) Near the bottom on one side of a sound sweet barrel bore a 1 in. hole. Insert a piece of gas-pipe 12 in. long (about 10 in. on the inside), and bend it upward in the cask. Into the outside end of the pipe fix a faucet. Wash 1 bushel of sand and small gravel till the water remains clear; mix it with one bushel charcoal [*see* FILTER (CHARCOAL)], and ram it down tightly in the barrel. Take a 2 qt. tin vessel, the shape of a garden flower-pot, and put it on the top of the sand and charcoal over the end of the pipe, mouth downwards. Fit a ½ or ⅜ in. tube into the bottom of the tin with cement, to admit air. Fill up the barrel ⅔ full with coal and gravel mixed, and place thin flat stones (not limestones) on the top. This filter is suitable for soft water only, and will last about one year. (2) Use an earthenware flower-pot about 9 in. diameter × 10 in. deep. Stop the drain hole with a piece of sponge. First put in 2 in. charcoal; next 3 in. fine sand; next 3 in. coarse gravel. Set it over an earthen jar, and let water drip on to the gravel slowly. (3) Use a wooden pail not painted on the inside, bore a hole in the bottom, and cover the bottom with flannel. First put in coarsely-powdered charcoal; next a layer of coarse river sand; next powdered limestone. Set it over a jar, and let water drip into the pail slowly.

FILTER: WINE-. If the wine be thick from sediment, put a wad of cotton into a funnel, and pour it through. If this does not answer, try FILTER-PAPER.

FIRE-BRICK: SUBSTITUTE FOR. Till new fire-bricks can be obtained, mix 1 part salt and 2 parts ashes with water, and apply as a cement. It hardens in 4 or 5 hrs.

FIRE-LIGHTER. Dip wood into a mixture of melted resin and tar, and leave to dry.

FISH POND. A pond for fish should if possible have fresh water running in and out all the year round. A very good pond may be constructed over springs which do not fail. If a stream run in one end, it is best to have it enter as a small waterfall, which, if sufficiently high, obviates the necessity of putting a grating across to keep the fish from working up the stream. Usually a dam will have to be formed at the farther end of the pond, and very often the ground will have to be excavated as well. To build the dam, first lay up a line of brick extending to within 1 or 2 in. of the line of the top of the dam. Build the earth on each side. Let the breadth at the top be equal to the height, and the base 3 times as

broad as the top. Face the sluiceway with stone or brick, and let it extend down to the bottom of the dam, so that the pond can be drained. Use strong iron grids of about ½ in. mesh to keep the fish in. The earth dug out when excavating should be used for the dam. Any portion not retentive should be filled with puddled clay, *i.e.*, clay pounded to a putty with water, and thoroughly worked with wooden rams with rounded ends. This clay filling should be not less than 20 in. in thickness. If the edges are of loose earth, they should be set with large cobble stones, and cemented in place. The more gravel and clean stones there are on the bottom of the pond the better. If the dam has to be built on quicksand or very loose soil, it is best to make it of bundles of hemlock and willow. Place the body of a tree across the river for the brush to rest on, with the tops up stream in all cases. When a good foundation has been laid, coat it with stone, and so on alternately till the required height is produced, reserving the largest stones and the lightest brush for the last layers. Make tight with gravel or clay, and stick willows every 2 ft. through the courses.

FISHING-LEADS. For sea fishing blow the contents out of a duck's egg, or an egg of suitable size, bury the shell in sand, and then fill it up with molten lead. Fix the lead to the line by boring a hole through it, or by suitable hooks, but place it, so that when the line is pulled through the water, the blunt end comes first. For fresh-water fishing use split shot or lead wire, which should be bent with a small hook at each end, and the line or gut twisted round it as shown in the illustration.

FISHING-LINES: HOW TO DRESS. (1) Boil equal parts raw linseed oil and best copal varnish, out of doors, till the mixture singes a feather. When cold immerse the line, and let it remain for a week if solid plaited; but for a fortnight if hollow plaited. Then hang it up fairly tightly between two posts in a position exposed to the wind, but protected from rain, and remove all superfluous dressing by squeezing the line between the thumb and finger, and drawing them along the line. After a fortnight of warm weather the line should be redipped in the dressing, and the operation of stretching and drying repeated. After another fortnight, take it down, and hang it up in coils from a nail in a room for four or five months before use. (2) Cut 1 oz. best white wax into thin shavings, and put them into a pot with 1 gill boiled linseed oil; heat gently till dissolved. While warm, put in the line, and leave for about 2 hrs., the dressing remaining just liquid, but not too hot, all the time. Then take it out, stretch it, remove the superfluous dressing, and hang it up to dry as for No. 1. After a fortnight, saturate a piece of flannel with vaseline, and run the line through the flannel. Hang the line up to dry again, and when dry, give another coat of vaseline. (3) Mix ½ pt. double boiled linseed oil with 1 oz. gold size, and treat the line with this dressing as in No. 1 for the first drying. Then redip the line for about 12 hrs. Wipe it down lightly to remove the superfluous dressing, and then wind it over a clothes-horse, and place it in front of a fire for a few hours. This will cause the dressing to flow evenly, and give a good final gloss. Then hang up between posts to dry as before, and then in a room for some months. (4) To redress a line, rub it thoroughly with a common white wax candle. Soak a piece of flannel

in boiled oil, squeeze it out fairly dry, and then rub it over the waxed line. Hang it up to dry as in No. 1. If it be possible to obtain an air-pump, coil the line in the dressing under a receiver, and exhaust the air. Leave it thus for ½ hr., then let in the air and leave for a minute or two. Then exhaust the air again, and leave for ½ hr., and then take the line in the dressing out of the pump, and leave for about an hour. Hang up to dry as in No. 1.

FISHING-RODS: SPLIT CANE. Buy the necessary lengths of East India or South Carolina cane from a tackle maker who makes a specialty of built-up cane rods. The cane should have a thick, hard skin, and be as free from joints as possible. Split out six pieces from each length as shown in Fig. 1., making the inside angle ACB of each section 60°, *i.e.*, make AB=AC=CB. The size of the rod must now be fixed; a typical rod is given at the end, but it would be impossible to give dimensions to suit all, and the most suitable sizes had best be got by testing some rods, till the right one be found, and then making up the new rod to the same dimensions. As the six segments are eventually glued together, as shown in Fig 2., which is a section through the rod, it will be seen that the length of one side of each segment is equal to the radius of the rod at that point. Cut out a template from sheet zinc or brass, and from the centre strike circles (a) and (c) Fig. 3, the radius of each being equal to the side of a segment at the top and bottom of the joint. Strike the circle (b) half way between these two. Then nick out the piece ABC and file up to the centre exactly, making the angle 60°. The six segments for this joint should fit into this angle, and the outside edge should just come up to circle (c) at the thin end, to (b) in the middle, and to (a) at the thick end. To plane up the sections, plane up a 1-in. board about 6 ft. long by 6 in. broad perfectly level, and with no winding. Then plough out three grooves, which should be at an angle of 60° as shown in section in Fig. 4. The first groove should taper, say, from ⅜ in. deep to ¼ in. deep, the next groove from ¼ in. to ⅛ in., the third

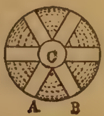


FIG. 1.

FIG. 2.

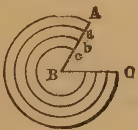


FIG. 3.

groove from ⅛ in. to flush with the surface of the board. If a suitable plough cannot be obtained, make up the board in sections as shown by the dotted lines, and glue together. Another board of the same size, but with the grain at right angle to the grooved board, should be glued and screwed on to the back to prevent warping. Two cross pieces of wood are screwed on to the board, one at each end. The section is now placed in a suitable groove, and one cross piece twisted over it and screwed down. The section being held firmly, it is planed *away from* the cross piece. When that end is sufficiently worked, the first cross piece is slacked out, and the other one screwed down, so that the end of the section not yet planed can

be finished in the same way as the first end.

Another method of planing up the sections is by means of a long shoot board, shown in section in Fig. 5. (F) is planed up perfectly square 1 in. × 4 in. × 6 ft. (D) is planed up perfectly square 1 in. × 6 in. × 6 ft. These two are then glued and screwed together. (E) is then planed up the same as (F), and then the two corners of (E) and (F) planed off to accommodate the section, as shown dotted in the illustration. Two or more pieces may be made for (E) to suit different sized sections, but the angle made by bevelling off the corners of (E) and (F) to accommodate the section must in all cases be exactly 60°. (E) is bolted down through (F) and (D), but the bolt moves in a slot, so that (E) can be moved slightly relatively to (F), thus increasing or diminishing the depth of the section at either or both ends. One end of (E) can therefore be tapped out slightly, so that the section can be planed up taper, but keeping the angle 60° all the time. An iron-faced plane must be used, and the template tried continually till the section is exactly of the right size and section. If the section be made a little long, it can be planed up and then cut to length, so that the template fits, but they must be so fitted that no two dressed-off joints or rings of the cane in the section come together. If the section be cut the right length at first, and slightly too much be planed off, it will have to be discarded. The top and middle joint sections being planed up, it may be found that the cane is not thick enough in the enamel to make the bottom joint. In that case, two pieces must be glued together for each section, or twelve pieces in all for the joint, as shown in Figs. 6 and 7. To fit the two pieces for each segment together, take off enough enamel with a very sharp plane from the inner piece to allow the glue to hold, and to make the piece straight in length, though still curved round in section. Now groove out the inside of the outer piece to fit the outside of the inner piece exactly, and glue together firmly, as explained later on in gluing the rod together. Then treat the two pieces glued together as one section, and plane it up as indicated by the dotted lines. When all the sections are complete, fit the sections together, and bind each joint separately at each end. It is most important that the *best* glue made rather thin be used, and that the wood is hot before the glue is applied. To make the wood thoroughly hot, cut a piece of gas barrel, say 6 ft. long as shown at (A) Fig. 8. Fit a cork into one end, and bore a hole through it into which a smaller tube (B) fits, which is corked at both ends. The other

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

end of (A) is connected by a tube to the spout of a boiling kettle, and a hole (C) is bored in it to allow the steam to escape. Now, introduce the rod-joint in (B) point first, and fit in the cork. Leave it there till the wood is thoroughly hot, and then take out the rod-joint a little at a time, say 6 in. Apply the fresh, hot glue, and bind round tightly; then glue another 6 in. and bind, and so on till the sections are all glued, and tightly bound together. Place this joint in a warm place to dry, for at least two days. Cut a piece of straight-grained cedar 1 ft. 3 in. × 1¼ in. × 1¼ in., and drill a hole 6 in. down the centre for the bottom joint to fit in. Slightly open the hole with a rimer, and cut a small groove down one side to allow the air to escape when the joint is driven in. Scratch the last 6 in. of the joint with sand-paper, and glue up. Now, plane the handle down to 1⅛ in. square, taking it off where necessary to make the handle in line with the rod. Then plane it up octagonal, and finally round off to suit the winch-fitting at the bottom, and as fancied at the grasp. The handle may be left plain, or it may be covered with pig skin, cane (as used for chairs) bound round spirally, or cork. Another way of making a handle, which is perhaps preferable, is to work up several thicknesses of bamboo by filing out the soft inside part, to slip over the rod, and then glue in place, and finally work down to the desired shape. Select double-brazed ferrules of a suitable size, take off just the corners of the cane to make it almost round, and roughen the surface; then take off the inside sharp corners of both ferrules, that fit on to the wood, with a rose-bit, and drive on the male ferrule, having applied Le Page's glue, and made the brass and the end of the joint hot.

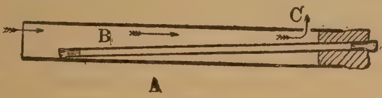


FIG. 8.

Now, bind the end of the other joint, which is to be driven into the corresponding female ferrule, very firmly with thread, and drill a small hole down the centres of each joint for the dowel. Bind on six thin strips of wood to project beyond the end, to serve as a guide for drilling these holes in line with the rod. Then rimer them out slightly taper. Drive in a piece of greenheart turned slightly taper each way for the dowel, and grind the greenheart into the holes with glass-paper, till of a perfect fit, and the cane-joints butt against each other. Then glue the dowel into the joint on which the male ferrule is fitted; then undo the binding on the joint, which is to fit into the female ferrule, and fit it on as the male ferrule was fitted. If the ferrules be not very strong, it is best to bind the top of the male, and the bottom of the female ferrule with thread before driving them on. The winch-fitting is next fitted and screwed in place. Then rub down all over lightly with No. 0 glass-paper, and polish. [*See* WOOD POLISHING.] Stretch a chalk line from end to end of the rod, and snap it, and then bind on the rings with best thread or silk, and well waxed with cobblers' or transparent wax [*see* WAX (TRANSPARENT)] exactly over the centre of this line. The distance of the rings from the tip may be 5½ in., 6½ in., 8½ in., 11 in., 14 in., and so on. Whip on small lengths of thread every 4

to 6 in. to strengthen the joints; also below and above the ferrules, under which the joint keepers may be fixed. Roll each binding between bits of hard flat wood, and then varnish the whole with five or six coats best coachmakers' copal varnish, allowing three days for one coat to dry before applying the next. Then finally polish all either clear or dull. Plugs or stoppers should be made to fit into the ferrules to prevent dirt getting in when the rod is not in use. Turn up a piece of greenheart, and glue it into a piece of cork, which should make a well-fitting plug.

Size of a 9 ft. split cane trout-rod: Top joint, $\frac{1}{16}$ in. diameter at one end tapering to $\frac{3}{16}$ in. diameter at the other end. Middle joint, $\frac{3}{16}$ in. diameter full tapering to $\frac{3}{8}$ in. bare. Butt, $\frac{3}{8}$ in. full to $\frac{9}{16}$ in. at top of handle.

FISHING-RODS: WHOLE-WOOD. The woods used for fishing-rods may be greenheart, hickory, blue mahoe, lancewood, washaba, ash, and sometimes the butt is made from deal, cedar or any light wood. Cane is also used, and it may be made up whole, or built up in sections. [*See* FISHING-RODS (SPLIT CANE)] For long bottom-rods, whole cane is best; for fly-rods, greenheart, the best quality mahoe, or split cane. Lancewood is also good, but hickory tends to set if subjected to a heavy strain. Whatever timber be used, it should be split, not sawn, from the log; the grain should be perfectly clean and straight, and free from "pins". The size of the rod having been selected, cut out one template for each joint, as shown in Fig. 1. (A) is drilled out to equal the section of a joint at the top, and (D) to equal the size at the bottom. (B) is made square, the sides being equal to the diameter of (A); and (D) similarly to (C). Plane up a 1-in. board 6 in. × 6 ft. smooth and without winding. Then cut three square grooves in it, the first $\frac{1}{2}$ in. deep × $\frac{1}{2}$ in. broad at one end, tapering to $\frac{3}{8}$ in. deep × $\frac{3}{8}$ in. broad at the other end; the next $\frac{3}{8}$ in. square to $\frac{1}{4}$ in. square; the third $\frac{1}{4}$ in. square to $\frac{1}{8}$ in. square, and fit cross-pieces as explained in FISHING-RODS (SPLIT CANE). Also make three similar grooves, but with V-shaped channels, the angle at the bottom being 90°. Another way is to make a shoot board, which is similar to that described under FISHING-RODS (SPLIT CANE), Fig. 5, only (E) is cut off a little narrower than (F), so that the wood is plained up square, as in an ordinary shoot board. Now, place

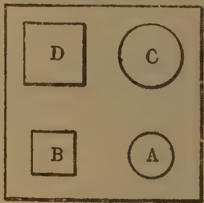


FIG. 1.

a piece of wood, say for the top joint of a fly-rod, in one of the slots, and plane up one side perfectly level by sighting along it, and using a jack plane. Then plane up the next side as before, making it square with the first side. Now, begin working down a third side, continually calipering it, and using the gauges (B) and (C) shown in Fig. 1. When this is nearly the correct size, say $\frac{1}{16}$ in. too big all along, begin on the fourth side, and plane that down till nearly right. Then plane each slightly alternately, till the gauges fit on tight. Then place it in one of the V grooves, and commence to plane it up octagonal. Finally file up round, testing continually with the round gauges (C) and (A). Repeat this with

the other joints till all are filed up roughly. Fit on the ferrules and dowels, as explained under FISHING RODS (SPLIT CANE), and screw on the winch-fitting and spear. Test the rod in the hand, and see how it works. If it seems stiff at any part, ease it very slightly, scraping with the edge of a broken piece of glass, and test again. If it be too whippy, shorten the joints very slightly. When all is satisfactory, French polish the rod [*see* (TO) POLISH WOOD] and bind on the rings. Give the bindings two coats of shellac varnish, leaving 3 hrs. between each coat. Then give all three coats of best coachmakers' copal varnish, leaving three days between each application. Each coat of varnish should be flatted with pumice powder, when dry, before applying up nearly to size as before, leaving the splice just a shade larger than it should be, if the rod were made from one piece of wood. Then fit on the winch-fitting, and test for play. Ease where necessary as before. Then wrap a damp rag round the splice, and when the glue softens, separate the joint. Then scrape off the glue and the paper, and finish in the usual way. A strong piece of whip-cord or salmon line should be bound on just below the splice, so that it can be twisted round the splice when the rod is put together.

Particulars of a 15 ft. 6 in. or 11 ft. 6 in. bottom-rod : make the butt from clean, straight-grained red deal 4 ft. long × $\frac{3}{4}$ in. diameter at ferrules, and $1\frac{1}{8}$ in. diameter at handle; winch-fitting about 7 in. long about 6 in. from the end.

FIG. 2.

the next. Fly-rods up to 12 ft. are often made spliced, and as this does away with ferrules, the rods are far easier to make, besides being easier in action. Some firms even make 18 and 20 ft. salmon rods spliced, but these take a considerable time to fit up each time they are used. The disadvantage is that if a jointed rod gets a set in it, the rings can be taken off, and bound on again, so that the rods work straight again. With a spliced rod the rings cannot be shifted round. First plane up each joint nearly to gauge, and then cut them and bind them together as shown in Fig. 2. The length of the splice from (A) to (B) being from 4 to 6 in. If the joints lie in line, take them apart and glue them together with a piece of paper in between. When dry, file The two middle joints are made from bamboo 4 ft. long, the larger one $\frac{3}{4}$ in. diameter at one end tapering to $\frac{9}{16}$ in. diameter at the other ; the smaller one $\frac{9}{16}$ in diameter tapering to $\frac{1}{2}$ in. The top joint is 3 ft. 6 in. long tapering from $\frac{1}{2}$ in. at one end to $\frac{3}{16}$ in. at the other end. This makes the 15 ft. 6 in. rod. To make the 11 ft. 6 in. rod, make another top joint 3 ft. 6 in. long to fit into the second bamboo joint tapering to $\frac{1}{4}$ in. at the end. The bamboo may be mottled by running a flame over it, so as to singe, but not burn, the enamel.

Particulars of a 9-ft. fly-rod : Make from greenheart in three 3-ft. joints. The butt is $1\frac{1}{8}$ in. diameter across the handle, $\frac{9}{16}$ in diameter just above it, and $\frac{3}{8}$ in diameter at the ferrule. The

second joint tapers from $\frac{3}{8}$ in. diameter to $\frac{1}{4}$ in. diameter from end to end, and the top joint tapers from $\frac{1}{4}$ in. diameter to $\frac{1}{16}$ in. full at the tip. The rings are spaced measuring from the tip $3\frac{1}{2}$ in., 4 in., 5 in., $6\frac{3}{4}$ in., $8\frac{1}{2}$ in., $10\frac{1}{2}$ in,, 13 in., and then about every 15 in.

Particulars of an 11-ft. fly-rod: Make in two 5 ft. 6 in. joints of the following sizes: 2 ft. from butt $\frac{7}{16}$ in. diameter; 4 ft., $\frac{11}{32}$ in. diameter; 6 ft., $\frac{9}{32}$ diameter; 8 ft., $\frac{7}{32}$ in. diameter; 10 ft., $\frac{1}{8}$ in. diameter; 11 ft., $\frac{1}{16}$ in. diameter full.

Particulars of a 12-ft. pike-rod: Make in four 3 ft. joints from greenheart. Butt, $1\frac{1}{8}$ in. diameter at handle to $\frac{3}{4}$ in. diameter at ferrule. Second joint, $\frac{3}{4}$ in. diameter tapering to $\frac{9}{16}$ in. diameter. Third joint, $\frac{9}{16}$ in. diameter to $\frac{5}{16}$ in. diameter full. Top joint, $\frac{5}{16}$ in. diameter full to $\frac{3}{16}$ in. diameter at tip.

Particulars of an 11-ft. 6-in. roach-rod in three joints: Butt, made from yellow or red pine, 3 ft. 10 in. long, $1\frac{1}{8}$ in. diameter at handle and $\frac{9}{16}$ in. diameter at ferrule. Middle joint, made from deal or bamboo, 3 ft. 10 in. long, tapering from $\frac{9}{16}$ in. diameter to $\frac{3}{8}$ in. diameter. Top joint, made from lancewood or greenheart, 3 ft. 10 in. long, tapering from $\frac{3}{8}$ in. diameter to $\frac{1}{8}$ in. diameter.

FLANNEL: HOW TO CLEAN. Wash flannel in warm suds, and do not use soap on the flannel itself. Never wash in the same water that other fabrics have been washed in, and wash white flannels in the suds before coloured ones. Directly the suds look dirty, throw them away, and make fresh. Rinse in warm water; do not wring, but hang up to drain, and dry where warm. [*See also* BLANKETS (HOW TO CLEAN]

FLEECE HORSE. A pulling horse for sheep pelts may be made as follows: split a smooth log 5 or 6 ft. long by about 1 ft. diameter down the middle. Fit two legs about 2 ft. long into one end, leaving the round side uppermost, and let the other end rest on the ground. For scraping off the pelt use a large wooden knife or "skiver". Soak the pelts for from 24 to 40 hrs. in running water; then hang them up in a warm room till the skin begins to ferment. If the skin be allowed to ferment too long it will stick to the roots of the wool. After pulling, the wool should be dried as quickly as possible—to prevent moulding.

FLOWER BOUQUET. *Making:* The central flower should be large and have a stiff stem. Fasten the smaller flowers loosely round it, with thin wire, and as the bouquet becomes large, moss or tissue paper may have to be bound round the stalks to prevent them being bent too much and breaking. If the stalk of a flower be too short, bind it to a piece of flexible stick with fine wire, and place a little damp moss at the end. When complete cut off the stalks even, and bind with silver paper and ribbon. A lace paper fringe, or pinked paper, gives a finish.

Preserving: Sprinkle lightly with water, and place the stalks in soap suds. Each morning take the bouquet out of the suds, and lay it sideways in fresh water for a few minutes; take it out, sprinkle, and return it to the suds. Change the suds every three or four days.

FLOWER STAKES. Dip about 7 to 14 in. of the sharp end of the stakes in boiling tar for 10 mins., remove, and let the tar drip off; then roll in sharp sand, and when dry dip again in the tar. Do not place more than the tarred portion of the stakes in the ground.

FLOWERS: CRYSTALLISED. Dissolve 1 lb. alum in 1 qt. boiling soft water, and allow it to cool

down to blood heat. Tie the flowers or grasses in a bunch, and then tie them into a basket made of copper wire. Sink the whole in the alum water.

Small crystals look best, and to obtain these, move the flowers about often, and when a slight crystallisation appears, remove, and allow it to drain for 12 hrs. The crystals may be coloured by dissolving a little indigo in the alum water for blue; carmine or vermilion for red; etc.

FLOWERS: HOW TO DRY. To preserve pansies, geraniums, etc., sift 1 or 2 in. of sharp river sand into a box, place the stems in this, and fix the flowers upright; sift sand over the flowers, arranging the petals from time to time in a natural position, and jarring the box to fill up all interstices. Cover the flowers entirely with sand, and if they be small, place them out in the sun on one or two warm days, if they be large, place the box in a warm oven at a temperature of 95° to 105° Fahr. Leave in the sand one or two weeks. Place a little quicklime in the bottom of a large-mouthed jar, insert the flowers, and then seal hermetically.

FLOWERS: FEATHER. Pull the natural flower to be copied to pieces, and cut the feathers to the shapes of each piece. Use natural coloured feathers for preference, but dyed white goose feathers are satisfactory. Employ two thicknesses of wire, the coarse for the stems, and the fine for fixing the petals to them. Another way is to form a bulb of equal parts resin and beeswax, and to fix the petals directly on to it. Wind the stems with green tissue paper, and form the flowers into wreaths, and bouquets.

FLOWERS: HOW TO PACK. Cut the flowers with the dew on them, and shake it off. Wet cotton-wool, wring it out, and wind it about the end of each stalk separately. Cover the bottom of a tin box with damp, stout, brown paper, and place a flower in; cover it with tissue or silver paper, then put in the next flower, and cover that with tissue or silver paper, and so on. Over all place a piece of tissue paper, then a layer of cotton-wool. Cover the box with paper.

FLOWERS: HOW TO PRESERVE. *Cut:* Flowers last longest when cut with the dew on them; shortest when under a warm sun. Put the stems in white sand and fill up with water till 1 or 2 in. above the sand. The water standing on the top should be changed every day. A little salt is often added to the water. When the flowers begin to look old, put the stems in hot water for 5 mins., and then cut the ends off. Replace in the sand, to which milk-warm water has been added. Put cut flowers out when the dew is falling if possible.

Funeral: The flowers should be fresh, pure white or of delicate tints, and without leaves. Melt the best paraffin wax in a cup set in hot water. Into this dip the blossoms, or brush them with a small brush, covering each one completely. To coat the leaves, chrome-green powder paint must be added to the wax, or wax leaves may be used. [*See* WAX FLOWER-MAKING] A moss ground can be used instead of leaves. [*See also* FLOWER BOUQUET]

FLOWERS: HOW TO PRESS. When possible press root, stem, leaf and flower, and gather them on a warm, dry day. Delicate wild flowers must be pressed quickly, thoroughly, and with a pressure that will not crush them. Place each specimen in a sheet of brown paper, and interpose several empty sheets between each that is filled. Press gently for the first day, just enough to prevent the petals, etc.,

curling. Take out the empty sheets of brown paper, dry them before a fire, and spread the filled sheets in a draught for ½ hr. or so. Then press again as before, but do not replace the empty sheets while hot. This should be repeated every day till the flowers are dried. Press more succulent flowers between white blotting or botanical paper, and between each filled sheet place a thick piece of cardboard. Change the cardboard, or dry it as above, every day.

To preserve the colours: dry blue flowers with heat, either with an iron, under a box of hot sand, or in a cool oven. Red flowers are injured by heat, but should be washed with a solution of 1 part muriatic acid to 3 parts alcohol; the best brush to apply this is a thistle just bursting into seed. Yellow and purple flowers need to be dried repeatedly in front of a fire, after being well pressed. White flowers turn brown if handled before being pressed. To keep fresh between gathering and pressing *see* FLOWERS (HOW TO PACK).

FLUTES: CRACKS IN. Melt 5 parts beeswax with 1 part resin, and press it into the cracks with the fingers. Pass the thumb over the cracks before commencing to play.

FLUTES: TO OIL. Leave raw linseed oil unshaken for several weeks, and then pour off the clear oil on the top. Pure olive oil is equally good. Remove any moisture, and apply the oil, inside and out, every time the flute is used for the first year; after that, once a month is sufficient. When the flute is to be used, wipe the oil out with an old silk handkerchief tightly wrapped round a stick, using as much friction as possible.

FLY-TYING. Select the necessary dubbing, wings, hackles, etc., and lay them handy. Put a hook (say a down-turned eyed hook, which is perhaps the easiest to tie) in the right-hand side of a fly-tying vice, and leave sufficient shank projecting to tie the body of the fly on. This vice is very long and narrow in the jaws, and had best be bought. Take a length of well-waxed silk [*see* WAX (TRANSPARENT)], and start binding from the eye towards the bend of the hook, leaving sufficient bare shank of the hook near the eye to tie in the wings and hackle later on. Wrap the silk evenly and closely down the shank of the hook, and avoid making the body too long. If the fly is to have tails, take three strands of a cock's hackle and secure them with two wraps of silk at the end of the body. Now, bind the silk back again towards the eye, till another layer of silk is laid over the top of the first. Twist the silk once or twice round the fly-nut on the vice, so that it does not uncoil. To make the wings, select for example two starling wing feathers, a right and left. Strip off the fag ends, and with the first finger and thumb divide a piece as broad as you wish one wing to be. Draw the tips down till even without separating the fibres, and holding the quill with the left hand, with a smart twitch separate the fibres from the quill. Do the same with the other wing. We have now two pieces of feather which are to be the wings of the fly. Place the left-hand wing of the fly on the first finger of the left hand, the inside of the wing uppermost, and on the top of this put the other wing, the outside uppermost, laying the tips evenly together, and then close the thumb firmly on them. Open the tips of the thumb and finger a little, and place the two wings on the shank of the hook as they are to appear when the fly is tied. With the right hand unwind the silk from the fly-nut, and draw the

Name.	Time of Year the Fly is in use.	Size of Hook. "New" Scale.	Tying Silk.	Wings.	Hackle.	Body.	Tail or Tag.
Cock-y-bondhu.	All summer and autumn.	0-2.	Orange.	*Tied buzz.*	Furnace.	Peacock herl.	Gold tinsel tag.
Hare's ear.	April.	1 or 2.	Yellow.	Starling.	Red cock.	Fur from the hare's ear.	Red cock's for tail and gold tinsel tag.
Yellow dun.	April-June.	1 or 2.	Yellow.	Starling or *tied buzz.*	Yellow dun.	Tying silk.	Honey dun tail.
Black gnat.	All the year.	00-1.	Black.	Starling or *tied buzz.*	Black.	(*a*) Tying silk; (*b*) Black horse hair; (*c*) Black ostrich herl.	Silver tinsel tag.
Alder.	May-July.	2 or 3.	Claret.	Centre feather from a hen pheasant's tail.	Red or furnace.	Bronzed Peacock herl.	*None.*
Red spinner.	April onwards.	0-3.	Red.	Starling.	Red cock.	Ruddy red floss silk ribbed with gold tinsel.	Red cock's hackle tail.
Iron blue dun.	April.	0-1.	Claret.	The tips of two feathers from the breast of a water-rail.	Yellow dun.	Mole's fur.	Yellow dun tail.
Black palmer.	All the year after a flood.	3-6.	Black.	*Tied buzz.*	Black.	Red floss silk ribbed down with hackle and silver tinsel or peacock's herl.	*None.*
Red palmer.	All the year after a flood.	3-6.	Red.	*Tied buzz.*	Red or furnace.	Orange floss silk ribbed down with hackle and gold tinsel or peacock herl.	*None.*
Red ant.[1]	June-August.	1 or 2.	Red.	Starling.	Red.	Claret floss silk.	A wrap of peacock herl for tag, and red tail.
Wren tail.[1]	July and August.	0 or 1.	Brown.	*Tied buzz.*	Feather from a wren's tail.	Red fur from the hare's neck ribbed with thin gold tinsel.	*None.*
Orange dun.	June-August.	0 or 1.	Orange.	Starling.	Red.	Orange floss silk.	Gold tinsel tag, and red tail.

[1] Also grayling fly.

silk down on the roots of the wings. Take two turns of the silk, still keeping the thumb and finger of the left hand in the same position. Pass the silk securely round the fly-nut of the vice, and remove the left thumb and finger to see if the wings set properly. If so, draw the silk to one side, and trim off the roots of the wings with a small sharp pair of scissors. Take two turns to form the head, holding the wings firmly. Do not allow the silk to slack or the wings will draw out, or slip round sideways. The wings for length should reach to the bend of the hook. Pass the silk behind the wings to tie in the hackle. Strip off the fluff from the bottom of the hackle, and lay the feather beside the wings, the root pointing towards the eye of the hook. Tie it in sideways close to the wings, care being taken not to disarrange them, with two wraps, and cut off the roots fairly close. With a pair of special fly-tying tweezers catch hold of the end of the hackle, and put on two or three turns close up behind the wings, keeping the hackle on its edge. This will make the wings set more upright. Secure with a wrap and two hitches. Cut off the silk and the end of the hackle, and trim up. The fly is now made.

For a dubbing body, twist dubbing on the second layer of silk sparingly, and wrap up to the head as before. More dubbing may be twisted on in the middle of the body, thus making it taper.

When dressing a buzz or hackle fly, the fly is made precisely as the foregoing, except that the wings are left out, and more hackle wound on. The hackle may be brought down to the middle or even to the end of the shank of the hook, as in palmer flies.

The body of many flies is made of peacock herl. This is wrapped with the second layer of silk, keeping it well on its side as if it were a hackle.

To make scale wings, select a scale from a freshly-caught fish of the required size; cut off the outer edge, and also the membrane on the under side of the scale. Place it between two sheets of newspaper, and press it for a few hours. Then soak it in water, and when soft cut it to the shape shown in the illustration. The two halves are then doubled back to back, and they are attached by binding the lug on to the hook.

It is a very good thing to take a well-made fly to pieces, and note how the wings, etc., are attached. A few standard flies for trout are given on the preceding page.

FOUNTAIN. Cut a good sized barrel in two parts, making one part equal to ⅓ barrel, the other equal to ⅔ barrel. Use the smaller part for the fountain basin, the larger for the reservoir. Sink the basin almost flush into the ground, and lead a lead pipe from underneath, coming up in the centre. Take a large thimble, and with a centre punch punch at all the dents in the top, and pierce small holes through. Solder this on to the tube to form a rose. Raise the other piece of the barrel about 4 ft. from the level of the basin, either banking it up, or blocking it up with rockwork. Insert the other end of the tube about 3 in. from the bottom, and cover the end over with fine gauze to prevent the fountain getting stopped. The reservoir may have pockets of cork nailed on, in which ferns and creeping plants can grow. The rockwork and growing plants may be led up it, always trying to make it as inconspicuous as possible. A few fish will thrive in the basin. No food need be given them after the plants once begin to flourish. They must of course be

removed during the winter. Near the water's edge plant fuchsias, ivies, lilies, etc.; next achyranthus, etc.; next geraniums, heliotropes, roses, etc.

FOWL-HOUSE. In building a fowl-house the following points are essential: (*a*) Free ventilation. (*b*) The nests to be reached without disturbing the fowls. (*c*) Warmth in winter. (*d*) The house to be easily kept clean. Allow about 4 sq. ft. for each fowl in building the house.

(1) For about twenty-five to thirty fowls make the house 12 ft. deep × 10 ft. broad. Put in four posts 6 in. × 6 in., the two front ones 8 ft. above the ground, the two back ones 11 ft. above the ground, for the corners of the house. Put in a floor of 1½ in. deal 3 ft. from the ground, supported by beams 4 in. × 4 in. nailed on to the four corner posts. Board with 1 in. match-boarding from the roof to the ground, placing the boards vertically on three sides, but leaving the fourth side (which should look towards the south) open all along the bottom from the floor to the ground, and leave 2 ft. 6 in. open from the roof to the floor on that side to fit in a door. Put on the roof, and let it overlap 2½ in. on every side. Cover it with thick felt, and thoroughly tar it [*see* ROOFING (FELT)], or cover the wood with corrugated iron. Cut a hole in the centre of the floor 18 in. square for the fowls to enter by, and stiffen the edges all round it. Put in an open-work wire window near the top on each side with hinged shutters over them to close in cold weather. The roosts should be put in on each side of the door, and they should be readily removable; the first one 18 in. from the floor, and three more spaced equally towards the top corners on each side. Place the boxes underneath, on racks, for the hens to lay in, 15 in. wide × 18 in. deep × 18 in. high. These should also be readily removable, and often cleaned. [*See also* FOWL NEST.] It is best to have a double door, the outside one of boards, the inside of open wooden trellis-work. The board door may then be left open in hot weather.

(2) For about eighty fowls: Make an octagonal house 20 ft. from side to side × 6 ft. 6 in. high from the floor, the floor being raised 2 ft. from the ground. Make the eight piers of 4 in. × 4 in. deal, tar the ends, and bed them into the ground, resting the ends on flat stones. Make the frame on the piers of 4 in. × 3 in. joists set on edge, halved, and nailed at the joints. Put on the floor with 1¼ in. boards. Another frame of the same size is made of 3 in. × 3 in. for the top, and covered with 1 in. boards, leaving a hole 10 in. × 10 in. on which is placed an octagonal chimney for ventilation. The two frames are nailed together with 1¼ in. boards, grooved and tongued together; and to guard against shrinkage, batten the joints with laths. Make a door 2 ft. 6 in. broad on the south side. Put a small latticed window on each side near the top with shutters hinged on to close them in winter. Leave a small opening for the hens to enter by on the south-east side, with steps leading up to it. Place a post in the centre with eight arms branching out to each corner—the two lower arms starting at two corners next to each other, and three more on each side, 1 ft. vertical pitch between. Put the first two arms 2 ft. from the floor. For a hen ladder to the roosts, place a board 2 in. thick × 8 in. broad at 45° to the floor, and nail small cleats square across the board 5 in. apart. Keep the floor covered with road sand a few inches deep. The

roosts may be made of wood, 3 in. wide at the top, the corners rounded, and a groove ¼ in. deep cut in them. The groove should be filled with kerosene once a fortnight. Under each a board is placed to catch the droppings, which should be often cleaned, and powdered with air-slaked lime. To purify the house from vermin light a small fire of green sticks on the floor, close all doors and ventilators, and leave for 1 hr.; then air for 1 hr. before readmitting the fowls.

FOWL NEST. Straw is better than hay. Use wooden nest eggs as they do not break the eggs. If an egg break, remove any that it has made sticky, wash them in warm water, and replace in the nest before the hen returns. Remove the eggs at nightfall, just as the fowls have gone to roost.

FOWL RUN. Make long portable runs for the fowls. [*See* FENCE (PORTABLE)] Let them work the ground, then run up another portable fence, open a space in the middle fence, and drive the fowls through on to the new patch.

FOWL-YARD. (1) Cut the posts 2 in. × 4 in. at the top, 4 in. × 6 in. at the bottom, and 12 ft. long. Sink 3 ft. 6 in. in the ground, leaving 8 ft. 6 in. above, and space them about 6 ft. apart. Nail on three rails 2 in. × 3 in., and then nail on upright strips of deal on the inside 10 ft. long and 1 in. × 3 in. at the bottom, tapering to 1 in. × 1 in. at the top. A base board 12 in. wide running round the bottom improves the appearance. (2) Set 4½ in. square posts 10 ft. long 4 ft. in the ground, and space them 8 ft. apart. Fix three tiers or rows of wire with staples 1 in. apart 1 ft. from the ground; another three rows 1 in. apart 3 ft. 10 in. from the ground; and the top three rows 1 in. apart a few in. from the top of the posts. Weave the laths 8 ft. long between the wires about 3 in. apart. Picket the top edge and chamfer the other end, and drive 6 in. to 1 ft. into the ground. Another way is to weave laths about 4 ft. long with 3 in. between each. Picket one end and chamfer the other end chisel shape of some other laths 4 ft. long; interweave these through the top three wires, and shove the chamfered end down beside the top of the bottom laths, lapping under the wires 2 in. The wires must be fixed to the posts very slack, for the weaving of the laths will take it up. (3) Wire netting is the cheapest, and most readily run up, but it is not so durable, and has not such a good appearance as fences. Run the netting over posts 4½ in. square × 12 ft., 8 ft. 6 in. being above the ground, or 6 ft. above the ground if the top be covered with netting. The netting should be chosen of so small a mesh, that small birds cannot enter if the top be covered.

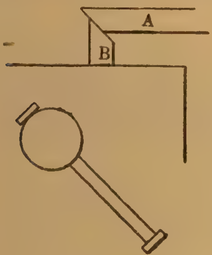
FRAME: COLD-. Construct as for a hot-bed [*see* HOT-BED], but facing either east or south. Have no bottom heat, but use good quality garden soil only, which should be at least 12 in. deep.

FRAME: PICTURE. *Composition Ornamental:* Mix whiting with thin glue to the consistency of putty. Rub the mould over with sweet oil, and press the composition well in. When a good impression is taken, take it out and lay it out to dry. If it be desired to fit the cast to a curved surface, bend it before the composition sets. [*See also* STUCCO]

Hanging: Cut strips of canvas 1 in. wide, and cover them with velvet or velveteen. Put a curtain ring on the junction of the two straps to hang over the nail, and tack the lower ends to the picture.

Mitre Joint: Cut off the four lengths necessary in a mitre block [*see* MITRE BOX] with a tenon saw, so that any knots or flaws

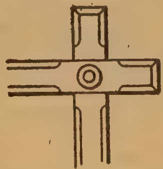
come in the middle, not at the ends of the lengths. Then plane them up in the mitre shoot nearly to size, planing one end of a length, which is to form a joint, gilt side up, and the other end, which is fixed to it, gilt side down. Then sharpen the plane, and take off a finishing cut. Screw up one length B in a vice, put the piece A which is to be fixed to B on the top, and slide



it ¼ in. along. Bore a small neat hole through A and half way through B, cover the ends with hot thin glue, and drive in the best sprig, not an ordinary cut nail, with a light hammer. As the sprig is driven home A will slip down B, making the joint exactly flush inside and out. Punch in the sprig, and fill up with putty; or the nails may be driven in secretly. [*See* NAILING (SECRET)]

Moss: Make a smooth frame of soft wood to the desired shape. Select the pale green moss that grows on beech trees and old logs. Paste it on with strong flour paste till the wooden frame is completely hidden. A cluster of acorns, shells or similar ornamentations may be fixed to the corners.

Oxford: Cut the lengths for the frame from oak or some finely-grained wood; plane them up perfectly square, and fit together with halved joints. Mark the joints at the back, so that they can be put together in the same order, and take the four pieces adrift. Gauge the distances of the bevels which extend down the edges, and cut them out with a spoke-shave; then draw-file with a flat dead-smooth file, and polish with glass-paper



wrapped over a board. Fit together again, glue and clamp together again, and when dry, glue on an ebony head at the corners, as shown in the illustration.

Passe Partout: This frame should not be made more than 12 or 14 in. × 10 or 12 in. Cut a piece of glass to the required size, and cut out a stiff piece of cardboard to match the glass. On the back of the cardboard sew two loops or rings to support the frame by. Lay the cardboard on a table, loops underneath, place the engraving on the cardboard, face upwards, and then place the glass over the engraving. Hold the edges firmly, and paste stout tape all the way round, letting the tape lap about ¼ in. over the glass. Leave it to dry, and then paste dark-coloured binding paper over the tape; let the paper overlap the glass about ⅜ to ½ in.

Perforated Cardboard: Cut from perforated cardboard two side-pieces and two end-pieces from 1 to 1½ in. broad, and as long as the length and width the frame is to be, allowing for projecting corners. Notch the ends, lay them in place, and tack together with fine thread. Then cut four more pieces of the same lengths, but one row of perforations narrower; lay these upon, and exactly in the middle of the

others, and tack as before. Repeat again, making the next layer one row of perforations narrower, and so on, till a width of only 2 or 3 rows is left for the top layer. The last one or two layers should be gummed on instead of sewn. If glass be desired, fit it neatly in at the back, and after the picture is in place, paste stiff, strong cardboard over the back. A light brass-headed nail, or similar ornament, may be placed at the four cross corners.

FREEZING MIXTURE. To make ice in small quantities, select three jars, one to fit inside the next, leaving about 2 in. gap between each. Place the water to be frozen in the inside one; one of the following freezing mixtures in the gap between the middle jar, and the jar containing the water; and sawdust between the outer and the middle jar. Cover all with two or three thicknesses of coarse canvas, and place in a spot where the air is cool and still. (1) Mix 8 lb. sulphate of sodium and 5 lb. hydrochloric acid. (2) Mix 3 lb. sulphate of sodium and 2 lb. dilute nitric acid. (3) Mix 9 lb. phosphate of sodium and 4 lb. dilute nitric acid.

FRUIT PICKER. Cut a circle 10 in. diameter from 1-in. deal. Bore ½-in. holes 1½ in apart and ¾ in. from the edge, and into these holes fit flat pointed pins 8 or 10 in. long. Mount on a handle of the required length at an angle of 30°. Pass the picker under the apple, and then upwards, so that the stem passes between two teeth; let the apple rest on the bottom, and with a slight twitch pull the apple.

FRUIT: HOW TO PROTECT. To protect trees and bushes from birds, fasten one end of a brown reel of cotton to a twig, and wind from twig to twig in different directions. This is not intended to actually prevent the birds from eating the fruit, but to frighten them, when they alight and knock against the thread.

FUR: CARE OF. After the winter is over, brush the fur the right way with a soft brush, fold it up, and cover it with linen, and store. (1) Put the furs in a cardboard box, and paste paper strips round all the joints, and over any cracks. (2) Put the furs in a paper sack, tie up closely, so that no moth can enter, and store in a dark place.

FUR: TO CLEAN. Unpick the lining, and take out the wadding, etc. Boil ½ lb. best white or mottled soap cut into shavings in 1 gal. water, and when dissolved let it cool till it is luke-warm; then mix in a handful of bran. Apply this liquid with a honey-comb sponge to the hairy side, wetting the skin as little as possible, then with the sponge clean the fur with pure cold water. Dry as quickly as possible, but do not place near a fire, and shake repeatedly whilst drying. If the fur dry hard, it must be rubbed soft before making it up again. Finally brush till the hair follows the grain of the skin. To keep clean, brush with dry pipe-clay on the brush.

FUR: TO TEST. Blow briskly against the incline of the hairs. If the hairs open and expose the skin, the fur is bad.

FURNITURE: HOW TO CLEAN. To remove white spots from tables, rub with camphor. To remove white marks left by hot plates, rub over with lamp oil on a soft cloth, and polish with another slightly dampened with methylated spirits. To remove cloudy spots, wet a woollen cloth with cold tea, not tea leaves, and rub over; then polish off very thoroughly with a soft duster. [*See also* POLISH (FURNITURE)]

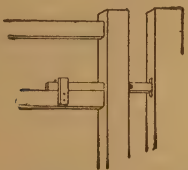
GALVANISED IRON. Scrub the iron in sand, pickle it in a solution of sulphuric acid, and then

immerse it in a bath of molten zinc. The zinc should be kept covered with sal-ammoniac or grease, to prevent oxidisation.

GAS: ESCAPING. To detect escaping gas, paint over the pipes with thick suds. Where the bubbles are formed are the points of leakage. Usually these points are at the joints.

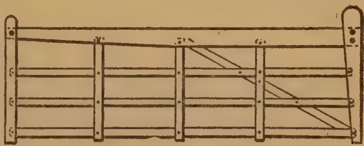
GATE: BAR. Across paths which are seldom used bars may be substituted for gates. The bars should be made of 1½ in. oak, ash or elm 6 or 7 in. deep, and with the corners rounded off with a spokeshave. To prevent the bars being shoved by cattle, make a shoulder on the drop end, and let the tenon reach through the post so as to take a small horizontal pin.

GATE FASTENER. For garden gates, where appearance is essential, buy a suitable fastener. For farm gates use a piece of wood which is slipped through a mortice hole in the head post, and a hole in the gate post. If the side of the gate be flush, nail two cleats on for the board to slip in. If animals



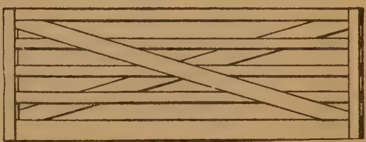
learn to slip back the catch, bore a hole in it close to the upright, when the catch is closed, and slip a pin in, so that the fastener will not slip back without the pin being removed, as illustrated.

GATE: FIELD. (1) Make the head post, heel post, top rail, and brace from oak or some durable hard wood. The rails may be made of cheaper wood, but if possible make up of good wood all through. Cut the heel post 4 ft. long, 7 in. × 3 in. at the top and 4 in. × 3 in. at the bottom. Cut the head post 3 ft. 9 in. long, 4 in. × 3 in. all through. Cut the top rail 8 to 10 ft. long to suit the width of the path, 7 in. × 3 in. for half its length, and then tapering off to 4 in. × 3 in. Cut the brace from 6 ft. to 5 ft. long, depending on the width of the gate, and 3 in. × 1 in. all through. Cut the rails and uprights from 3 in × 1 in. wood.



Fit altogether with tenon joints, with the exception of the brace, and pull together with hardwood taper pins driven in, the inside of the joints being previously painted with white-lead paint. The brace should be only slightly sunk in the top rail and heel post, just enough to take the thrust. Fix the rails and uprights where they cross with strong nails, and clinch the points. The gate should be hung square with the path, not with the highway.

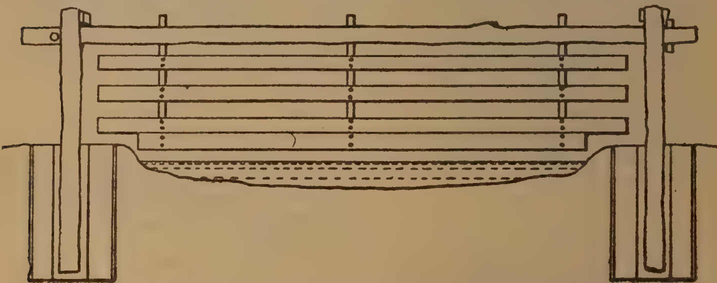
(2) This gate should be made from 1¼ in. or 1½ in. wood throughout, and is not so strong as No. 1. Cut four pieces 4 in. broad



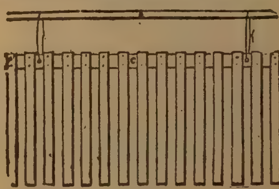
× 10 ft. long for rails. Cut one piece 8 in. broad × 10 ft. long for the bottom rail. Cut four pieces 4 in. wide × 4 ft. long, two for the heel post and two for the head

post, and lay two of them on the floor 9 ft. 4 in. apart. Nail the rails on, spacing them suitably, the top and bottom rail being flush with the tops and bottoms of the heel and head posts. Turn the frame over, and nail on a brace 6 in. wide, butting against the top of the heel post and the bottom of the head post. Then turn it over again, and nail on the two pieces left for heel and head posts exactly over the half heel and head posts already on. Then cut out, and nail on a brace as before, letting it cross the first brace, or run parallel with it.

GATE: FLOOD. The proportions of the piers and timber depend on the size of stream, strength of flood, etc. Take for example a stream 20 ft. broad.



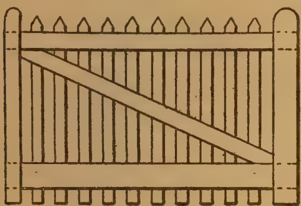
Dig two holes 3 ft. 6 in. square with vertical sides 6 ft. deep on either side of the stream about 3 ft. from the edge. Line the sides with 1½ in. boards. Make a box 1 ft. 6 in. square outside and 6 ft. 6 in. long, and cover the outside with the following mixture: Cut yellow soap into shreds, boil and stir until it is of the consistency of paint. Lower this box end on into the hole; the end will then stick out 6 in. above the ground level. Mix 1 part good Portland cement and 6 parts thoroughly-washed gravel with water. Turn this concrete into the holes, and when the concrete has set remove the centre box. For gate posts select branches about 12 to 14 in. diameter at the thick ends × 10 ft. long before they divide into two, making forks, as shown in the illustration. Cut off the two branches about 18 in. above the fork, and rough off the bark from the bottom 6 ft. Put the thick end into the hole left in the concrete by the removal of the long boxes. Mix pure Portland cement, and with it fill up the space left between the gate post and the concrete. Stay up the post, and leave the cement to set. Repeat for the other gate post. Nail a piece of hardwood into each fork to make a good bearing for the cross pole to turn on. Have the cross pole 8 to 10 in. diameter. It is an advantage to taper the post off to



6 in. diameter at each end, but it is not essential. Place the cross bar into the two forks, and nail a

cleat across each fork to prevent the cross bar floating off in a flood, but leave plenty of play for the cross bar to turn easily. On the cross bar drive in strong oak pins near the posts to prevent end play. Nail on boards as shown, or they may be suspended from the cross bar by chains. Another form is shown made of slats attached to the cross pole with chains. For smaller streams, and streams not liable to severe floods, the concrete is unnecessary, and the posts may be fixed direct in the ground.

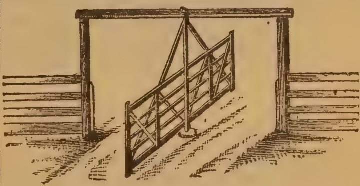
GATE: GARDEN. Make the head post 2 ft. 6 in. × 2 in. × 2 in.; heel post, 2 ft. 6 in. × 3 in. × 2 in.; top rail, 3 ft. × 2 in. × 2 in.; bottom rail, 3 ft. × 3 in. × 2 in.; brace about 3 ft. 10 in. × 2 in. × 2 in.; and slats about 2 ft. 6 in. × $1\frac{1}{2}$ in. × $\frac{3}{4}$ in. Join the square frame together with tenon joints, and fit the top of the top rail 3 in. below the top of the head and heel posts; the bottom of the bottom



rail 2 in. above the bottom of the heel and head posts. Draw up tight with hardwood pins, and then fit the brace in tightly. The slats should project beyond the top and bottom rails about the same amount as the heel and head posts, and should be firmly nailed on to the brace as well as the two rails. All the joints should be painted with white-lead paint, and fitted together before it dries.

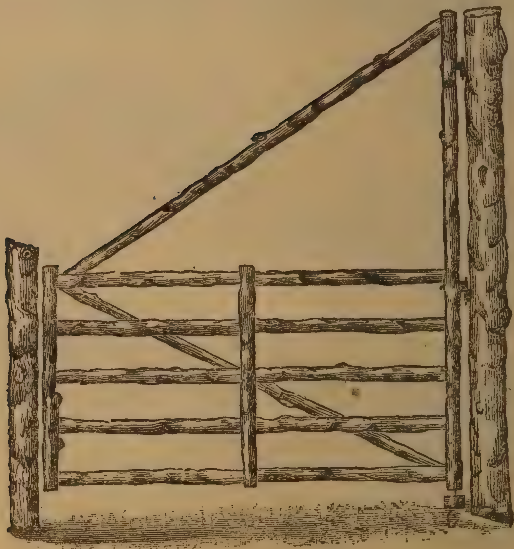
GATE: HOW TO HANG. Fix the hinges on to the gate post. Wedge the gate up in the position required when finished, and mark off the position on the heel post. Take the gate down, bore the holes, and wedge up again, and fix in place. Have the top hinge long enough, so that the nut may be tightened to pull up the head post if the gate sags. Put a bolt, with washers at each end, through the gate above and below each hinge to prevent the heel post from splitting.

GATE: HINGELESS. A bed piece is set in the ground in the centre, upon which the ends of the scantling rests which supports the gate. An iron pin is let into each end of the scantling to form pivots in the bed piece and cross frame.



A general idea may be formed from the illustration. The space occupied must be double waggon width, and the double latches are inconvenient, but the gate has the advantage that it will never sag.

GATE: NON-SAGGING. (1) Cut two pieces of 3 in. × 4 in. scantling, one piece 6 in. shorter than the desired height of the gate, and the other piece twice the length of the first. Cut the rails from $1\frac{1}{2}$ in. deal 6 in. broad, and let them into the head and heel posts their own thickness, so that the gate is flush on one side. Before nailing up, recess in a brace, made from $\frac{3}{4}$ in. board 4 in. broad, from the top of the head post to the bottom of the heel post. The gate should be flush on this side. Nail down the rails, and brace on to the head and heel posts; also nail at all points where the brace crosses the rails. Nail on $1\frac{1}{2}$-in. battens to the heel



and head post on the flush side, and also one on each side of the rails in the centre. Fasten one end of a $\frac{3}{8}$ or $\frac{1}{2}$ in. iron rod to the top of the heel post, and the other end through the head post with a nut and washer on the end to draw the rod up tight. After tightening, cut the rod off even with the nut. (2) Another way is to dovetail the brace from the bottom of the head post to the top of the heel post, thus doing away with the iron stay. (3) This gate is also shown as made in rustic fashion. [*See also* GATE (RUSTIC)]

GATE-POSTS. A plan sometimes adopted is to hinge the gate to a living tree. This is not recommended, though it has the advantage that the gate never sags. Oak is the best wood, and, if possible, select a well-seasoned small tree, or large limb of about 2 ft. diameter. Leave the part that is to be inserted in the ground, and 6 in. above, full size, removing the bark only. Work the rest down to the required size, cutting away equally on all sides, so that the heart of the wood remains. If the limb or tree has a branch projecting at about right angles near the thick end, cut it off about 3 ft. from the trunk, and place the post into the ground, so that the branch sets away, and tends to balance the gate. Pack well under this branch; place large flat stones on the top of it, and pack firmly down with earth. If ready cut wood be used, set both posts firm and deep in the ground. Dig a trench 9 in. deep × 6 in. broad from one post to the other; tramp the bottom of the trench well down, and fit in a brace 6 in. square, butting hard against each post. Slightly char the part of wood inserted in the ground, whether made from a limb or ready cut. Mix 2 parts tar, 1 part Burgundy pitch, and a sprinkling of quicklime, and steep the charred part of the wood in this composition for a week or so; then sprinkle with sand. Apply two coats of this composition to the rest of the post, using it as paint.

GATE: ROADWAY. Make this precisely as the heavy field gate described [GATE (FIELD No. 1)], only leave out the rails and head post. An iron strap may be screwed on to the bottom of the brace and round the heel post to strengthen. Adjustable hinges are best used so that the sag may be readily taken up.

GATE: RUSTIC. A rustic gate may be made cheaply, and is advantageously used where strength is not important. Round poles should be used only, with the bark left on. In the head and heel posts bore $1\frac{1}{2}$-in. holes, and cut tenons in the end of the rails to fit up against the uprights, leaving shoulders preferably so that they fit up flush nearly half-way round the posts. Just inside the gate post set a log 6 or 8 in. diameter 2 ft. into the ground. Saw off square 3 or 4 in. above the ground, and in the centre of the log bore a 2-in. hole, 3 in. deep. Tenon a pin on the end of the heel post $1\frac{7}{8}$ in. diameter × $2\frac{1}{2}$ in. long with a square shoulder to work in this hole. Use an ordinary hinge for the top. [*See also* GATE (NON-SAGGING)]

GILDING. (1) The background must be smoothed with glass-paper, and then have a good thick coat of a paint made with whiting and size. When dry rub down with No. 0 glass-paper or pumice stone, and if any dark parts show through, give another coat; and when dry, smooth down as before. Now, lay on good oil gold size, and leave it till it becomes "tacky". If a finger-knuckle be pressed against it and pulled away, the size should click, and leave the knuckle dry Place the leaf on with a gilder's

knife, and tickle it down with a hare's foot. If the surface be very irregular, it may be necessary to apply another layer of gold size, and give a second layer of gold leaf, after the first is dry. Another way of applying the leaf to the size is to lay a piece of tissue paper on a flat surface, and rub paraffin wax gently over it till it is shiny all over. Then cut it up into squares the size of the leaf; place a square on the top of a leaf, wax side down, and the leaf will adhere. The leaf may now be readily applied to the tacky size. The leaf may also be readily picked up from the pad with a gilder's brush if it be previously stroked down the cheek or hair. The gilder's pad is a piece of wood shaped like a square painter's palette, with a thumb-hole at one end to hold it by, and a piece of stiff paper glued upright at the other end to form a wind screen. The leaf is laid on the pad, and cut to the required shape with a knife. If only a small quantity of gilding has to be done, it is not worth while to cut the leaf before applying it, but merely brush off the surplus leaf when the size is dry; but if much gilding has to be done, it is best to cut the leaf on the pad, and save the odd pieces, which can afterwards be sold. The knife should not be sharp enough to cut the wood of the pad, but sharp enough to readily divide the leaf. (2) Sprinkle fine bronze or gold powder [*see* GOLD POWDER and BRONZE POWDER] over the wet size. When dry, brush the article, which may then be varnished. [*See also* BOOK-EDGES (HOW TO GILD)]

GILDING GLASS. (1) Melt isinglass with water in a water-bath as glue; while warm, lay it evenly on to the glass, and leave to dry. Then breathe upon it, and apply gold leaf as in ordinary gilding [*see* GILDING], and then apply a coat of oil gold size over it. (2) Sprinkle metal powder over the wet size as explained under GILDING. (3) Mix metal powder with borax and water to a paint, and apply it. Then heat it till the borax melts, and cements the powder on to the glass.

GILDING METALS. (1) Rub the metal with soda amalgam, pour on a solution of chloride of gold, then drive off the mercury with heat, and polish. (2) Immerse alloys containing copper or zinc in a hot or cold solution of cyanide of gold. Other metals can be gilded by immersion in a solution of cyanide of gold, attaching a wire to a piece of zinc in a porous pot containing potassium cyanide, as in a Bunsen cell. (3) Dissolve gold in aqua regia, evaporate to dryness, and redissolve in water. Then add three times its bulk of sulphuric ether; agitate, and leave for 24 hrs. in a stoppered bottle. The gold solution will be found floating as a yellow liquid on the top; and if it be poured off, and clean steel be immersed in it, the metal immediately becomes gilded. If parts of the steel be varnished, they do not become gilded, and thus patterns may be traced.

GILDING: TO RENOVATE. Mix 2 oz. purified nitre, 1 oz. alum, and 1 oz. common salt in 1 gill water. Apply it to the gilded portions with a brush as paint.

GIMP STAIN. To remove the brightness from gimp: (1) Hang the gimp near the ceiling over a gas jet. (2) Mix 35 grs. nitrate of silver, 1 dr. sulphur, and ½ dr. vaseline to a paste. Smear this paste over the gimp, and leave for 10 mins. (3) Hang the gimp up in sulphur fumes [*see* BLEACH WOOLLENS (HOW TO)]. (4) Dissolve 1 part bichlorate of platinum in 7 parts water. Immerse the gimp for 5 secs., and then rinse immediately in clean water, or the silk will be rotted.

GLASS: HOW TO CLEAN. To clean windows use whiting or ammonia, and rub with newspaper. If they be dirty or sticky use a mixture of oxalic acid, alcohol, and equal parts kerosene and sperm oils. Soak dirty ground glass in hot water and soda, and then scrub with dilute ammonia water; finally rinse in clean cold water. For lenses, mirrors, etc., use a chamois cloth only.

GLASS: HOW TO CUT. (1) The best is a diamond. For thin glass scratch or cut on one side only, and then bend the glass as though trying to open the scratch. For thick glass scratch on both sides. (2) Grind an old triangular file to a three-cornered point, and temper it glass hard. [*See* TEMPERING] Keep the cutter thoroughly wet with camphor dissolved in turpentine or dilute sulphuric acid. Hold the cutter slightly inclined forward, and draw with a gentle pressure over the glass. (3) Place the tube or vessel in water to the height where it is desired to break it; fill the tube to the same height inside. Pour oil inside and out on the water. Cut a ring of paper, fitting the tube, saturated with benzine or alcohol so that it touches the oil, and pour a little inside the tube. Set it on fire. (4) At the edge of a sheet of glass make a nick with a three-cornered file. Apply a small flame to the nick, and a crack will run before the flame in any desired direction.

GLASS: HOW TO DRILL. (1) Keep the drill freely lubricated with camphor dissolved in turpentine. Glass may be filed, sawn with a fret saw, etc., if the tools be kept wet with camphorised oil of turpentine or dilute sulphuric acid. The drill should be glass hard. (2) Cement a block of wood to the glass with beeswax in which is a hole the size required to be drilled, to serve as a guide. Then fit a piece of copper tube of the size required into the drill holder, and lubricate with emery and water or turpentine. The emery becomes embedded in the copper, and so a hard cutting edge is obtained.

GLASS: HOW TO FROST. (1) Mix sugar of lead with varnish; apply with a paint brush, and stipple it over with a soft dry brush. (2) Mix 1 tablespoonful well-ground whiting with 2 or 3 qts. milk, and apply as No. 1. (3) For screens, etc., lay the pane of glass horizontal; cover it with a strong solution of sulphate of zinc, and leave to dry. (4) For greenhouses, mix whiting with thin glue and stipple into.

GLASS, GROUND: IMITATION. (1) Mix 18 parts sandarac, 4 parts mastic, 200 parts ether, and 80 parts benzol. Thoroughly clean the glass, apply the varnish evenly, and leave to dry. (2) Apply dammar varnish evenly but sparingly, and leave to become tacky. Then place white bobbinet over it, and roll it in, till it becomes perfectly united with the varnish, and quite smooth. [*See also* ETCH (GLASS: HOW TO)]

GLASS: HOW TO PACK. Place the heaviest articles at the bottom, and mark "Glass—This side up" on the box. Pack all tightly with straw or hay, placing a good thickness of new straw at the sides, top and bottom. If the articles be very heavy, or are to be sent a long journey, make the straw or hay slightly damp.

GLASS POWDER. To prepare very fine glass dust, as used in cements, heat the glass till liquid, and let it drop into cold water. Take out the fragments, and grind them up to an impalpable powder in a mortar.

GLASS: SCRATCHED. If the scratches be not deep, make a thick pad of felt, and polish, using putty powder and water on it, and rub with a circular motion. If it

be badly scratched, mix 5 parts water with 1 part hydrofluoric acid; rub it on with a pad, and remove it quickly. Care should be taken to keep the hands free from the acid.

GLASS: HOW TO SILVER. The glass should be first thoroughly cleaned. [*See* GLASS (HOW TO CLEAN)] (1) Dissolve 1¼ oz. Rochelle salt in 3 oz. water, and filter.

Dissolve 1¾ oz. nitrate of silver in 4 oz. water, and add to this solution 1 oz. liquid ammonia drop by drop until a brown precipitate remains; then add fresh ammonia, and then silver solution alternately, until the whole of the silver solution has been used, and the mixture has some of the brown precipitate in suspension, then filter the solution. When it is required for use, mix this latter silver solution with the Rochelle salt solution, and 12 oz. water; then lay the plate glass face downwards on the solution, and leave for at least ½ hr. The silvering should be varnished immediately, to prevent oxidisation.

(2) Dissolve 154 grs. nitrate of silver in 17 fluid oz. distilled water, and then add weak ammonia drop by drop until the precipitate at first produced is nearly all redissolved. Filter and make up to 34 oz. with distilled water.

Dissolve 31 grs. nitrate of silver in 34 oz. distilled water, and then raise the liquid to boiling-point in a porcelain dish. Dissolve 23 grs. Rochelle salt in a little water, and mix it with this boiling liquid, and continue the boiling till the precipitate becomes grey. Then filter and allow to cool.

Mix equal quantities of the first and second silver solutions; lay the glass out horizontally, rinse it, and then flood it.

GLASS, STAINED: IMITATION. Mix transparent pigments, such as are used for painting magic lantern slides, with fine varnish. Coat a thin piece of glass with it, and lay another piece of glass on the top of it, so that they are cemented together.

GLASS: HOW TO TOUGHEN. (1) Heat the glass from 300° to 400° Fahr., and then drop it into oil. (2) Boil the glass in a solution of common salt in water for one or two hours; then take it off the fire, and remove the glass from the liquid when it is cold.

GLOVES: HOW TO CLEAN. (1) Put the gloves on, and rub with a flannel dampened with sweet milk and coated with soap; then use a clean flannel dampened only, and dry carefully. (2) Put the gloves on, and wash the hands in benzine; then work them till dry, rubbing one hand over the other. This method is not suitable for very delicately-dyed gloves. (3) Mix equal parts alcohol and ammonia, or equal parts alcohol and camphene. Lay the gloves on a cloth, and rub the mixture all over with a sponge towards the fingers. Then dip the glove into the solution, take it out, squeeze it in the hand, and go over again with a sponge as before. Puff into the glove to swell out the fingers, and hang it up by a thread to dry. This method is not suitable for delicately-dyed gloves. (4) Melt 3 oz. good hard soap in 1 oz. warm water, 1 oz. hyposulphite of soda and 1 dr. ammonia water, and apply to the stretched glove with a flannel.

GLUE. Good glue should be of a transparent orange colour, and free from spots. It should only dissolve in hot water, not cold. A shaving cut from it should be like horn, not brittle; and it should not bend in the cake, but snap violently. To test the glue after it is melted, make a good joint between two pieces of wood; glue, clamp, and leave them for 24 hrs.; then drive in a chisel

at the end of the joint, or a wedge all along it, when the wood should split anywhere but at the joint. Glue in the cake may be preserved for any length of time if kept dry; but if it be melted down with water, it looses its strength to a great extent after the first week. Break up the glue into small pieces, and fill the inner pot of the glue kettle three-quarters full. Then fill up with water, and leave it to soak for at least 10 hrs. Then pour water into the outer pot, and place it over a fire. Leave the pot on till the glue begins to *boil* the first time, after that it will be sufficient to melt it only. Then add water till the glue is of the consistency of fresh cream. The glue should only be applied very hot in a thin layer to both edges of the joint, which must be quite clean, and if possible hot; slip the one piece backwards and forwards over the other till all air and most of the glue is expelled, and then clamp them together under pressure, and leave for at least 12 hrs., preferably 3 or 4 days. To separate a glued joint, wrap a wet rag round it, and leave for from 12 to 24 hrs.; then rap one side, holding the other firmly. If the joints do not separate, apply hot water with a cloth.

GLUE: BOOKBINDER'S. Mix 4 oz. starch with 6 oz. water, and 6 oz. spirits. Mix 2 oz. best liquid glue with 2 oz. turpentine, and stir it in, and mix with the starch solution.

GLUE: EMERY. To fasten emery powder to leather, boil the glue very thin, add a little milk, raise the pile of the leather, and put on the glue. Then sprinkle on the emery powder.

GLUE: FIREPROOF. Mix a handful of quicklime in 4 oz. linseed oil, boil it to a paste over a fire, spread it out on plates, and leave it to dry slowly. This may be dissolved, and used as ordinary glue.

GLUE: FLEXIBLE. Mix 1 part glycerine with 4 parts common glue, and use in the ordinary way.

GLUE: ISINGLASS. (1) Dissolve broken isinglass in boiling water; strain it through calico, and then evaporate it till it turns hard and dry when cold. Then heat up and add a little alcohol. (2) Boil and strain 1 lb. glue. Boil and strain 4 oz. isinglass, and mix it with the glue and ½ lb. sugar. Then boil the whole till thick, and cast it into moulds. When this glue is cold, it may be cut up into small pieces, which are readily dissolvable in water, and the glue is then ready for use. (3) Place isinglass in a bottle, and place the bottle in boiling water. Add acetic acid drop by drop until a thick paste is formed. Stir well, and when it is required for use put the bottle in boiling water.

GLUE: LEATHER TO METAL. Soak 2 oz. coarsely-crushed gall nuts in 1 lb. distilled water for 6 hrs., then filter through linen. Pour 1 lb. cold water on 1 lb. glue, and leave for 24 hrs.; then heat to form concentrated glue. Coat the leather with the warm nut gall extract, put the glue on the warmed and roughened metal, lay the leather on, keeping it in place under pressure, and allow it to dry in the air.

GLUE: LIME. Dissolve 3 parts glue, broken into small pieces, in 12 to 15 parts saccharate of lime, by warming. This glue remains liquid when cold. The consistency is varied by varying the proportion of the saccharate of lime.

GLUE: LIQUID. (1) Break up 12 parts best glue, and soak it for 24 hrs. in 32 parts cold water. Then melt it in a glue-pot, and let it boil. When it liquefies, add 2 parts hydrochloric acid, and 3 parts sulphate of zinc, and thoroughly

mix. Keep it in a bottle with an oiled cork. (2) Mix glue in the ordinary way and add (*a*) nitric acid, (*b*) hydrochloric acid, (*c*) chloride of zinc, (*d*) vinegar. Vinegar is often added in larger quantities to make mucilage. These acid or liquid glues are good for attaching paper to glass or metal.

GLUE: MARINE. (1) (*a*) Dissolve 3 parts powdered shellac in pure ether; dissolve 1 part india-rubber in pure ether, and mix the two liquids together. (*b*) Dissolve 4 oz. finely-shred rubber in 2 lb. coal oil, and then add 4 lb. powdered shellac. Heat and mix, and then pour out into moulds to form cakes when cold. Apply as common glue, and use pressure. (2) Place 1 part finely-shred india-rubber in a linen bag, and suspend it in a jar half-filled with 12 parts rectified petroleum, so that it is only half-immersed. Leave it thus for about two weeks in a warm place, when the liquid will be made. Melt 1 part asphaltum, and then mix it in the rubber solution at a gentle heat. When mixed pour out into moulds to set. To use, heat to about 300° Fahr. slowly, so that it does not burn, and if possible heat the article to be joined to 200° Fahr. Apply very thin, and leave to set under pressure. (3) Dissolve 4 oz. gum-sandarac and 4 oz. gum-mastic in 8 lb. methylated spirits. Add 8 oz. turpentine to 1 lb. best thick glue, and filter through muslin. Mix all together, and apply as ordinary glue, letting it dry under pressure. (4) Add a small quantity of bichromate of potash to the water with which the glue is mixed.

GLUE-POT. Support an iron pot round the rim by a larger external pot, and drill a few small holes near the top and half-way round the inner pot. When the water boils in the outer pot, the steam will pass out through these holes and prevent the glue hardening on the edge where the surplus glue is pressed out of the brush. If the holes were drilled all the way round, it would be awkward to empty the glue out.

GLUE: HOW TO PRESERVE. To prevent glue turning musty or mouldy, add sufficient carbonate of soda to give it a strong smell; or carbolic acid; or extract of cloves. Glue freshly mixed, or at most not more than a week old, is much stronger than glue which has been made some time.

GLUE: STAMP. Dissolve common glue, and evaporate down in the glue-pot till very thick. Add an equal amount of glycerine, and continue evaporating till all the water is driven off; then pour it out into moulds, or on a marble slab. This is used for stamps, printers' rollers, galvano-plastic copies, etc. "Sweet glue" is made in the same way, only sugar is used instead of glycerine.

GLUE: WHISKY. Break up the glue and put it in a glass-stoppered bottle. Cover it with whisky; shake it up, and leave for three or four days. If the glue be not all dissolved, add more whisky; but if too much whisky be used, the glue will separate out in a white viscid substance. This glue remains liquid except in very cold weather, when it should be placed in warm water.

GLUE: WHITE. Cover thin pieces of glue and isinglass with alcohol for 24 hrs. Melt over a fire, and then add powdered chalk till opaque.

GNAT OINTMENT. Mix 1 part olive oil and 2 parts tar oil, and anoint the face and hands with this mixture. If already bitten, rub over the spots with ammonia.

GOLD: TO CLEAN. Mix 4 oz. chloride of lime, 4 oz. bicarbonate

of soda, and 1 oz. common salt in 3 lb. water, and keep it in a closed bottle. The gold should be immersed in the liquid for some little time; but if it be very badly stained, heat it before immersion.

GOLD POWDER. Grind up gold leaf with honey or thick gum in a mortar; then remove the honey by mixing it up with water, and decanting several times, leaving the leaf as powder behind.

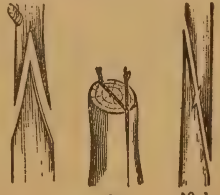
GOLD : TO TEST. (1) Where not noticeable, make a scratch that would penetrate through plate, and drop on nitric acid. If pure gold the metal and acid will be unaffected; if impure gold it will only be slightly discoloured; whereas if a base metal, such as brass, a violent chemical action will take place, the acid turning bright green immediately. Nitric acid turns silver black; the more adulterated the metal is the greener will the spot left be. (2) Slightly wet the scratch and rub over it with lunar caustic. If the metal be gold or silver, the mark will be faint; if inferior, it will become black.

GONG : HOUSE. Turn a piece of hard wood tapering from 8 in. diameter to 1½ in. diameter, and bind No. 6 B.W.G. steel spring wire round it in a spiral. Then pull it off the wood, and press the spiral down flat, the wire having been wound so that the coils now almost touch. Bolt it flat between two iron plates; make all cherry red, and plunge into cold salt-water. Then polish, and temper blue on a sand bath. [*See* TEMPERING]

GONG : OUTDOOR. Cut a length of 16 ft. from a 1½-in. bar of iron or spring steel, and taper the last 4 or 6 in. of each end gradually off to a point. Bend it to the shape shown in the illustration, making the two arms equal in length and each about 4 ft. long, the ends being bent to circles about 4 in. in diameter, and the loop at the top being made to suspend it by. Then thoroughly polish it all over, removing all scale. If struck with a wooden hammer the sound will be duller than that produced by striking it with metal, but it will be heard as far. A gong thus made can be heard in the country under favourable circumstances for over a mile, the distance depending to a great extent on the direction and force of the wind.

GRAFTING. Cut the scions from perfectly-ripened shoots of last year's growth as soon as the buds begin to swell, though only one bud is left on each scion as a rule. The scions should be less advanced in vegetation than the stock to which they are to be grafted. Bury them in moist sand, and then graft as soon as the stock begins to push vigorously. To make a successful graft it is most important to bring the inner barks of the stock and scion into intimate contact. When once the wood is cut, the graft should be made as quickly as possible.

Cleft: The common method known as cleft grafting is shown in No. 1. Cut the stock with a fine saw, and split down with a



NO. 2. NO. 1. NO. 3.

sharp clean knife or chisel. Make the scion of wood formed in the previous year, and wedge-shaped

at the butt. Hold the slit in the stock open with a narrow hard wood wedge at the side, place the scion in, and gently remove the wedge. Be sure that bark touches bark. If the graft be small, bind it firmly with string, and cover it with grafting wax [*see* GRAFTING WAX], or bind with strips of cloth spread with the wax.

NO. 4

Saddle: Saddle grafting, as shown in No. 3, is a good method when the stock and scion are of about the same size. The stock should be cut wedge-shaped, and then the scion cut to fit it. To bind the graft in place *see Cleft.* No. 4 shows a combination splice of "Splice" and "Saddle" grafting.

Splice: Splice grafting, as shown in No. 2, is a good method when the scion and stock are of the same size. Cut the scion to a wedge, split the stock, and then cut out the stock to fit the scion. Leave a bud on the upper end of the stock, and one on the lower end of the scion. To bind the graft in place *see Cleft.*

GRAFTING CHERRY. Cut the scions before the buds begin to swell, and put them in a cool dark cellar, covering them with damp moss. When all fear of severe frost is over, graft [*see* GRAFTING (*Cleft*)] one-half or two-thirds of the branches of a healthy tree, grafting the remaining branches next year. Insert the scions into branches 1 to 2 in. diameter.

GRAFTING VINE. Graft in early spring immediately the sap begins to move. Healthy, well-ripened wood must be used, usually the most successful being when the stocks are the size of a lead pencil. If the soil be clayey and wet, spread a few shovelfuls of sandy soil round the graft. Remove the soil around the stem down to the roots, saw it off about 4 in. above that spot, and then split square across, as in top grafting orchard trees. Cut the scions wedge-shaped, and set them in the cleft. If the stock be large, say over 1 in., put a scion in on either side of the cleft, bark to bark. Wind round tightly with cotton twine, bank up with earth till only the bud is left above the ground, and cover with an inverted flower-pot till the graft has

thoroughly taken. A graft may be made in a branch, which can be conveniently layered, burying the graft under the ground. In grafting very large stocks, cut the scion bevelled and tapering to a point, cut the stock to fit, and insert with pressure. The cleft may be wedged open, so that when the wedge is removed the scion will be gripped firmly. A good idea will be obtained from the illustration. Bind firmly in place with bast, and cover the parts above the graft with clay worked up to a putty. Raise light earth over all up to the bud, or if there be danger from frost, 2 in. above.

GRAFTING WAX. *Bandage:* Melt together 3 parts resin, 3 parts beeswax and 3 parts lard. Tear the

rags into strips 1½ to 2 in. wide, and drop them into the wax while melted. Leave to cool sufficiently, so that when the rags are taken out the wax sticks to them, and they are well glazed.

Common: Melt together 4 lb. resin, 2 lb. beeswax and 1 lb. tallow. Pour the mixture in water at blood heat, oil the hands, and work the wax till it becomes pale yellow. To use, place the wax in a bucketful of tepid water.

French: (1) Melt together 1 lb. resin, 1 lb. pitch, 10. oz. beeswax, 8 oz. tallow and 8 oz. yellow ochre. To use, warm till liquid, and apply with a brush. (2) Melt and mix 1 lb. pitch, 1 lb. beeswax and 2 lb. cow-dung. To use, warm till as soft putty.

Liquid: For covering wounds, etc., melt together 1 lb. resin, 8 oz. beeswax and 8 oz tallow. Dissolve as much shellac as possible in 5 oz. alcohol. Mix these two liquids together, and reduce to the consistency of paint by the addition of more alcohol. Apply with a brush.

Standard: Make the same as for *Common*, only for 1 lb. tallow substitute 4 oz. tallow and 4 oz. linseed oil. If the wax be too brittle, add more oil; if too liquid, add more resin. When only a few grafts are to be made, clay kept in place with tow may be used.

GRAPES: TO PACK. Leave the grapes 24 hrs. after being gathered before packing. Then pack them in the box as level as possible, sift in cork dust and temporarily fix on the cover Place the box on its end, and jar it. Then take off the cover, and fill the cavity with more grapes and cork dust, and then nail down the top permanently.

GREENERY. Procure an unglazed earthenware flower-pot, and soak it in water; while wet sprinkle the surface with Timothy seed. Fill it with water, and set it in a dark place for a few days.

GREENERY: BOTTLE. Cover a bottle fairly tightly with flannel, soak it in water and then rub over it mustard seed, flax seed, cress seed, etc. Hang the bottle up in the window of a warm room, and sprinkle it with water daily.

GREENERY: CONE. Sprinkle grass seeds, etc., into the openings of an old pine cone which has shed its seeds. Cover slightly with fine sand, and place the cone in a wine-glass filled with water. In a few days the cone will have closed up its openings—in a few days more the grass will sprout.

GREENERY: GOBLET. Cover the bowl of a wineglass, the stem being broken off, with red flannel. Place it mouth downwards in a plate of water, and keep the plate always full. To cover with seeds *see* GREENERY (BOTTLE).

GREENERY: SPONGE. Sow a sponge full of rice, hemp, canary, grass and other seeds. Place it in a shallow dish in which a little water is continually kept. When the seeds have well sprouted, suspend the sponge by cords, and water daily.

GREENERY: WHEAT-HEAD. Soak an ear of nearly-ripened wheat, leaving the stem about 6 in. long, for 12 hrs. in water; then put it in a vase, and place the vase in a dark cupboard until the grain sprouts. Then bring it out into the room.

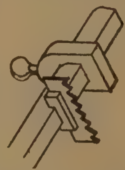
GRIND TOOLS: TO. Hold the tool square across the stone, and keep a good supply of water, or the tool may be burnt. Grind wood chisels to a bevel of 30°; plane irons 35°; turning chisels 45°; moulding chisels, or chisels used for very hard wood or ivory from 50° to 60°; flat engineers' chisels 65° to 85°. The finer a tool is ground the cleaner is the cut, but it dulls and breaks more readily

than a coarser ground tool. Hammer heads should be ground flat for driving nails, but convex for using with an engineer's chisel, etc.

GRINDSTONE. Keep a grindstone under shelter. Do not let the bottom of the stone rest in water when not in use. This can be arranged by hinging the trough at one end, and having a strap at the other end with two holes in it, so that when the trough is raised, and the lower hole in the strap pressed over a pin, the bottom of the stone is in water. When not in use, lower down the trough, and hitch the pin into the top hole of the strap. Another way is to have two cans with taps near the bottom, and a tap fitted in the bottom of the trough. Place one can over the stone, and turn on the tap so that it drips on to it. Place the other can to catch the drain from the trough. When the top can is empty, the two cans should be exchanged. Distribute the wear evenly all over, and do not keep a narrow tool in one place when grinding. When a stone is driven by a treadle it should be rehung now and again, as most of the grinding comes on the down stroke of the crank.

GRINDSTONE: TO TRUE. If a grindstone becomes eccentric, it is best to true it up, if possible, with a special tool with a small rotating wheel made for the purpose. A rather laborious method is to turn the stone round and mark the high parts with a piece of chalk. Then true up as near as possible, chipping with a cold chisel. Repeat the chalking and chipping till the stone is circular, but rough. Then finish by holding an old square file or a piece of gas barrel against the stone, turning the metal round and round so as always to present a new sharp edge, and running the stone dry. Another way after roughly chipping is to fix a long stout piece of wood, as broad as the stone is wide, so that it can be levered against the stone. Tie the long end of the lever to some fixed object with a rope, and insert a large flat piece of iron between the other end and the stone. Rotate the stone, and lubricate with sand and water. The lever must be so stiff that there is no spring in it.

GROOVING AND REBATING. When it is required to cut a groove for a feather to fit in, as for instance in match-boarding, or the sliding motion for the frame of a camera, it is best to fit up a small circular saw in a lathe. If this be impossible, knock the scriber out of an ordinary gauge, and wedge a piece of saw blade in, as shown in the illustration. Another way is to fix the board in a vice with another board behind it, and then using a thin distance piece, cut a groove with a tenon saw.



GUN: HOW TO CLEAN. Obtain good powder, and when not in use place a well-fitting cork in each barrel. To clean use tow wrapped on an elastic rod. Dip it in hot water, and rub backwards and forwards, then rinse out, and rub again till the tow comes out quite clean. Dry with tow, place near a fire, and then rub with slightly oily tow.

GUN RAMROD. Split the rod from straight-grained greenheart, hickory or similar wood. Plane it up perfectly square, then plane off the corners till it is a tight fit. Make a good working fit with sand-paper.

GUTTA-PERCHA: HOW TO CLEAN. Rub over with a mixture of soap and powdered charcoal, and polish with a dry, soft, clean cloth.

GYPSUM. Mix 4 per cent. powdered marsh mallow root with gypsum which hardens in 1 hr., and it can then be turned or cut. An addition of 8 per cent marsh mallow to gypsum can be painted or polished.

HAIR-BRUSHES: HOW TO CLEAN. Dissolve ¼ oz. soda in ½ gal. hot water. Comb the loose hairs out, and dip the bristles only, not the back, in the hot water several times. Rinse in cold water, and put near a fire, or in the open air, to dry. 1 teaspoonful of ammonia water, or a little saleratus, may be substituted for the soda.

HAM BARREL. Select a barrel widest at the bottom and gradually narrowing to the top, not bulging in the centre. Only use sweet barrels; and if meat has been spoiled in a barrel, never use it again for storing or pickling. Do not use a barrel that has been used for any other purpose. Let all animal heat go out of the flesh before packing. (1) First put a layer of rock salt 1 or 2 in. deep, then pack in a layer of pork as tightly as possible, then more salt, then another layer of pork, and so on till full, and fill all the crevices with rock salt. Fill up with soft water to which ½ lb. saltpetre may be added, and put a weight on the top to keep the meat immersed. Keep the brine strong by occasionally adding more salt. (2) The same as for No. 1, only pour in brine as strong as salt will make it instead of water.

HAM: HOW TO CURE. The pork barrel should be kept in a cool place. (1) For 100 lb. meat, mix 8 lb. salt, 4 oz. saltpetre, and 1½ lb. sugar in 4 gals. water, and steep the meat in it for 4 weeks. To keep the meat after warm weather, the pickle must be boiled. By using 2 oz. instead of 4 oz. saltpetre, the brine may be used for beef to be dried. (2) For 500 lb. meat, mix 1 lb. dry and finely-powdered saltpetre, 1 peck salt, 1 lb. brown sugar and 1 qt. molasses. Rub the meat well with this mixture, and pack it skin downwards. After being in salt 3 or 4 weeks, take the meat out, wash, dry and hang it for smoking. (3) Mix 7 lb. salt, 3 oz. saltpetre and 6 oz. red pepper in 4 gals. water. Pack the hams fairly loosely in a barrel, scald, and skim the pickle, and cover the hams with the pickle. Leave them to pickle for 6 weeks, take them out, wash them, and hang them up to drain for a day; then smoke. (4) Rub in 1 tablespoonful saltpetre to each ham, where the leg is cut off, on the flesh side, 1 dessertspoonful for each shoulder, ½ dessertspoonful for each middling and jowl. To salt, pack ½ in. thick salt on the flesh side. Lay the hams on the floor first, next shoulders, next jowls, last middlings, having previously removed the spare ribs. Lay strips of plank a few inches apart over each layer, and leave for 6 weeks. (5) Mix ½ bushel salt, 3 lb. brown sugar, 2½ lb. saltpetre, and 1 qt. best molasses. Rub the pieces well with the mixture before wetting them for pickling. Take the meat out of the pickle once a week for 6 weeks. The first two times the meat is taken out, add a plate of alum salt to the pickle. The same brine, if it remain sweet, becomes better year after year.

HAM: HOW TO SMOKE. Set a hollow log, or a cask with both heads removed, over a pit with sloping sides, dug large enough to hold the fire pan. Hang the hams on sticks, which should be supported across the top of the log. Fit a cover over the top resting on these sticks, so that the smoke will pass slowly but freely out between the top of the log and the cover. Fit the log in the ground,

so that no smoke can escape at the bottom. Build the fire of damp hard wood, sawdust and some shredded peat in a pan. In cold weather smoke twice a day; in warm weather once.

HAM: HOW TO STORE. Store ham in a cool place in one of the following ways: (1) Place the ham in a strong muslin bag, and put it in dry chaff or hay. Examine it occasionally, and if it be damp, renew the hay or chaff. (2) Place the ham in a dry barrel, and cover it with wood ash. (3) Leave the ham hanging in the smoke-house.

HAMMER. Do not break stones or hard substances with the hammer. For driving nails, etc., the face should be flat, so that a line across the face will run parallel with the centre of the shaft. Engineers' hammers should have the face convex. The shaft should be made of best straight-grained ash. To fit, rasp the end of the shaft down till about the right shape and size for the head to fit on. Drive the head on, and see if it beds square all ways with the shaft; if not, take it off and file away where the head has marked the shaft on the side necessary. Repeat again and again till the head sets perfectly square, and drives evenly and firmly on the shaft. Take off the head, and saw a slot down the centre of the shaft from the end to the bottom of the rasp marks. Put the head on, and wedge up tightly with a finely-tapered ash or oak wedge. Cut off square at the end. Now shape the handle to suit the hand, which should be widest about two-thirds up. If the shaft should work a little loose, soak the head end in water for a few hours. If the head should work loose even then, drive in a taper S-shaped wedge made from a piece of mild steel plate. The steel wedge will bind the shaft and the wooden wedge firmly together.

HARNESS BLACKING. When harness turns brown, thoroughly wash the surface with potash water, and then apply the blacking. [*See* BLACKING (HARNESS)] Occasionally rub with tallow and lampblack to keep the leather pliable.

HARNESS KNIFE. A strong knife is necessary for cutting leather. A good knife may be made from a scythe blade, or similar piece of steel. Grind the blade to shape, and fit on a handle made of tough wood riveted through the metal and wood.

HARNESS: TO REVIVE. Mix 1 heaped tablespoonful lampblack and 2 oz. beeswax in 1 pt. oil. Leather varnishes are as a rule harmful to the leather. [*See also* BLACKING (HARNESS)]

HARNESS, WASHING. Remove all mud by dashing water over it, and do not *rub* any off. Mix a little Castile soap in warm soft water, and having unbuckled every strap, apply it with a sponge; then go over with an oily cloth. Old harness which is very dry should be well oiled before it is washed.

HARROW: SLAB. Cut a thick heavy slab 7 ft. long, and draw a line parallel and near to the front edge. Make the teeth of $\frac{5}{8}$-in. iron, and let them project 4 in. below the slab. Mark off 20 points $3\frac{7}{8}$ in. apart on the line, and put the teeth alternately 1 in. in front and 1 in. behind each of these marks. The holes should be bored or mitred for the teeth to drive in tightly, and the teeth should be sharpened before being driven in. Attach a stiff tongue with the rounding side of the slab down. Ride or put weights on it. Sap the drag half-way as you go round, the same way as it was ploughed. [*See also* ROLLER (SUBSTITUTE FOR FIELD)]

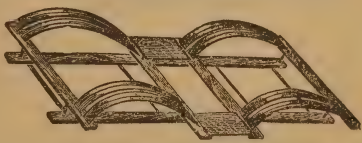
HARROW: THIRTY-TOOTH. (1) Cut four pieces of well-seasoned

oak 3 in. × 3 in. × 5 ft. long for outsides. Cut two pieces of the same material 5 ft. 6 in. long for centres, and plane all up square. Lay three pieces in the right order, and mark off five points in each 13 in. apart for the teeth, leaving 4 in. over at each end of the two short pieces. Put bolts or rivets through the ends of each bar to prevent it splitting. The cross-pieces should be made of oak 3 in. wide × 1 in. deep × 2 ft. 3 in. long. They should be mortised midway through the bars and in between the two outside teeth at

each end. Make the hinges of iron rod long enough to run through the section from side to side and to take a nut. Make a lip on the pivot part of the hinge, so that the sections will not go together except when one half is lifted perpendicularly. This prevents unhinging on rough ground. (2) A lighter harrow may be made similar to No. 1, but the outside bars to be 4 ft. long, the centre bars 4 ft. 4 in. long, and each section to be 2 ft. wide over all. Pitch the teeth 11 in. apart, the outside ones 4 in. from the end.

HAT: TO DRY A WET SILK. Leave the hat to dry partially, then wrap a dry towel round it, moving the towel a little way with the lay of the silk. When nearly dry rub with a hot cloth till glossy.

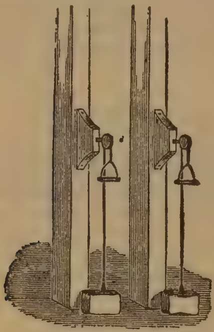
HAY RACK. Cut two pieces of 2-in. × 4-in. oak as long as the waggon requires, for bed-pieces, and frame together by four cross-pieces, each 1 in. below the top face of the bed pieces. Fit the two outside cross-pieces 10 in. from the ends, and the other two pieces to divide the space equally. The cross-pieces are made just so long that the bed-pieces fit snugly between the stakes of the waggon Four in. from each end of each bed piece, set up a 2-in. × 4-in. post 10 to 12 in. long with a round tenon, and put a 2 in. × 6 in. cross plank across at each end, which is long enough to project at least 6 in. beyond the outer edge of the wheels. The corner posts should be set up broad ways with the length of the planks



so that a good support is made for them. Fit two 2-in. × 6-in. planks across the centre of the bed-pieces between the wheels, and as far apart as possible, but having regard to the clearance of the wheels. Mortise each end of the four cross planks, and put in thin elm wheel boards, as shown in the illustration. Small poles may be bent, and substituted for the wheel boards. The four cross pieces holding the two bed-pieces together being 1 in. below the face, boards may be slipped through and rested on them, to form a solid bottom.

HEALTH LIFT. Attach two pulleys to the wall 2 ft. apart, and about as high from the ground as the user's shoulders. Attach a weight to one end of a four-stranded rope 4 ft. long, slip it over the pulley, and bind a handle on to the other end. To make the hand-piece, bore holes through two round sticks 6 in. long near the

ends. Bind the rope about 8 in. from the end, and then divide the 8 in. into two equal parts. Slip one division through each hole in



the stick, and knot in place. The hand-pieces should reach to 6 in. above the hips when first using the lift, but should be shortened to hang at the breast after a little time.

HECTOGRAPH OR GELATINE COPYING PAD. (1) Warm 4 parts glue, 20 parts glycerine, 1 part finely-powdered boric sulphide or kaolin, and 15 parts water in a water bath, and thoroughly mix; then add 2 drops oil of cloves, and pour out whilst liquid into a bottle. To use, place the bottle in hot water, and when the gelatine melts pour it out into a shallow tray. (2) Melt 1 lb. gelatine or 1½ lb. glue previously soaked in water till quite soft, and 6 lb. glycerine in a water bath for a few hours to drive off any superfluous moisture. Then add a few drops of oil of cloves to prevent it turning mouldy and to take away from it any unpleasant smell there may be. (3) Soak 4 lb. glue in 5 parts water and 3 parts ammonia till quite soft; then melt in a water bath, and add 3 parts sugar and 8 parts glycerine, and a few drops of oil of cloves. To use, pour the gelatine whilst hot and liquid out into a shallow tray, say ½ in. deep, and leave it till it is perfectly set. Write on glazed paper with the special ink [*see* INK (HECTOGRAPH)], and use a medium nib, keeping it well supplied with ink. If more than one coloured ink be used on the same sheet, let one colour dry before writing with the next. Rub over the gelatine with a damp sponge, then press down on it a clean sheet of paper, and remove it; repeat pressing down fresh sheets, till the paper is only slightly dampened, and not wetted. The ink on the paper being dry, roll it down with a cylindrical ruler on to the gelatine, starting at one end and rolling to the other, using only slight pressure on the ruler. When the paper is down, go over with the hands, prick any air bubble there may be, and press the paper down. Leave the sheet on for from 1 to 10 mins., depending on the ink, and then peel the sheet off. Take a clean sheet, press it down very lightly with the tips of the fingers, and peel it off again almost immediately, when a copy of the original will then be found printed upon it. Numbers of copies may be taken in this manner, but the sheets taken off later must remain on the gelatine longer. To clean the gelatine, sponge it over with hot water immediately. If the ink be left for a week or so, it will soak into the gelatine, and a new series may be printed and take without washing it. To make hectograph sheets, keep gelatine No. 3 liquid, and float a sheet of blotting paper on the top. Immediately this is saturated, lift it up and drain, and then allow it to cool. When solid, dip the sheet in the gelatine again to get a shiny surface. This sheet may be used to take three or four series of impressions, the blotting-paper absorbing the ink in between, but afterwards the sheet becomes useless.

HEDGE : TO PLANT. Prepare the land by back furrowing and fertilising. Plant the sprigs 8 in. apart, and cultivate for three years. Plough a deep furrow 2½ or 3 ft. from the hedge, the land side of the plough next to the hedge. Bend the hedge down to a horizontal position diagonally with the line of hedge, cover the tops with earth and tramp well down. Leave 2½ or 3 ft. of the base of each uncovered. In the spring the hedge will send up numerous sprouts. In the latter part of June clip to within 6 in. of the base of the sprouts; the next September clip 6 in. higher. Clip twice a year, each time 6 in. higher, till of the desired height. It is said that a hedge destroys the fertility of the ground as far as the roots extend.

HOE : GARDEN. To sharpen, file the side next to the handle bevel at about 30°. The hoe should also be filed slightly convex from edge to edge.

HORN : IMITATION. Powder the hardest portions of ox or deer's horn, and boil them in a strong potash lye. This soon becomes a paste, which may be moulded as desired. It may also be used as a cement or filler if mixed with acid or liquid glue.

HOT-BED. Make the bed in the latter half of February, earlier or later according to the season. Locate with a southern aspect, in a sheltered corner if possible, but if it be exposed, erect shields to protect it from the north and east winds. Make the sash in three sections. For the framework of each section use 3-in. × 1½-in. pitch pine, or best deal. Cut two lengths 3 ft. 3 in. long for the top and bottom, and two lengths 6 ft. long for the sides. Mortise and tenon joints at the corners are best, but the corners may be halved, painted and screwed together. Down the centre of the frame let in a piece of 1-in. square deal 5 ft. 8 in. long. This should be let into the frame ¾ in., and ¼ in. should be cut from the bottom of the strip at each end so that the top of the strip lies flush with the top of the frame. The frame will now have two divisions 1 ft. 4 in. broad air space. Subdivide these two divisions again as before; there will now be four divisions with 7½ in. air space between. On the centre of each of the three 1-in. strips nail a piece of ½-in. square deal. Nail the same down the sides of the frame, only ¼ in. from the inside edge. The glass will thus have ¼ in. on each side to rest on. (1) Cut seventy-

FIG. 1.

two sheets of glass 8 in. × 11½ in. Nail the bottom sheet lapping ¼ in. over the frame; nail the next sheet lapping ¼ in. over the first sheet, and so on up to the top, using six sheets in each row. Fix with brads lying sideways on the face of the glass, and then putty. Paint all joints with white-lead paint before fixing, and when in place give two or three more coats. Repeat for the other two sections. (2) Before screwing on the ½-in. square strips pulverise 1 oz. sugar of lead in a little oil, place it in a kettle, and add 3 oz. powdered resin and 1 qt. linseed

oil, and heat till all is dissolved. Stretch muslin over the frame, pour the hot liquor over it, and fix it in place with brads. (3) Mix 2 oz. lime water and 4 oz. linseed oil at a gentle heat. Beat together 1 oz. white of egg and 2 oz. yolk of egg, and mix with the linseed oil and lime water. Stretch white cotton cloth of close texture over the frame, and apply the mixture as paint. Give several coats, allowing each one to dry before applying the next, till the cloth becomes waterproof. Cloth and muslin prepared as in Nos. 2 and 3 make good substitutes for glass. The bed does not become so over-

FIG. 2.

heated by their use when under a strong sun, but they are not so durable as glass, and should be kept under cover, when not in use. The sash being made, drive four 4-in. square pieces of pitch pine into the ground, to nail the frame on to. The two posts for the back should project 20 in. out of the ground, the two front ones 14 in. The sash should overlap the frame 1 in. all the way round. Make the frame from 2-in. wood, so that the outside edges of the posts will be 9 ft. 3 in. apart lengthways, and 5 ft. 6 in. apart breadthways. Before nailing on these boards, dig out the pit about 2 ft. deep. The bottom of the pit must be well drained, if the bed be not made on gravelly soil. Fill up the bottom 18 in. with good manure, with plenty of straw in it; if possible use manure that has never been moved. Shake the manure well to break up the lumps, and if in good condition, add some sawdust. Stamp evenly down all over the bed, and sprinkle over with water. Half leaves and half manure may be used instead of adding straw and sawdust. Cover the heating material 6 in. deep with best loamy soil. Nail the frame on to the posts, and cover with the sash. In a few days it will be ready to

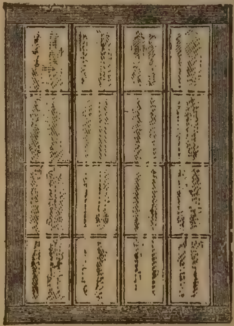


FIG. 3.

receive the seeds. If the frame become too hot, which can be felt by placing the hand in the earth, raise the sash a little. To prevent the bed getting too cold, cover it over with straw matting, straw, hay or rushes. When the plants are plainly discernible, put 1 in. blocks under the lower end of the sash during the day, but lower the sash down at night and cover with matting.

HYACINTHS: MOSS FOR. Fill a wire or similar basket with moss, and bed hyacinth bulbs in it with one-third of their thickness above. Press the moss down firmly, saturate the moss with

water, and place in a cellar, or a cool but not cold closet. Take it out after five or six weeks, and hang it in the light. The moss must at all times be kept saturated with water.

HYACINTHS: SPONGE FOR. Imbed the bulbs in an old sponge, and place in a china bowl. Treat in the same way as HYACINTHS (MOSS FOR). When removed from the cellar, sprinkle the sponge with grass seed, to form a green bed.

HYACINTHS: TO TRAIN. Make a long funnel of paper, such as is made by grocers, and paste together. Cut off the point, and place it mouth downwards over the bulb. The hyacinth will grow tall, and when tall enough, remove the funnel, and leave to bloom.

ICE CHEST. Procure two boxes, one about 8 in. smaller than the other each way. On the inside of the smaller box nail cleats, and place movable trays on them. Sift perfectly dry sawdust 4 in. deep over the bottom of the larger box, and press it well down. Place the smaller box on the sawdust in the middle of the outer box, and drill a small hole through the bottom of both boxes and the sawdust, and fit in a piece of brass tube. Sift dry sawdust into the space left between the two boxes, and tamp it well down. Make a hollow cover to fit the 4 in. left at the top, and fill this also with sawdust. Place the ice in the bottom of the inner box, the provisions on the shelves, and the cover in place. Support the box on legs or bricks at the corners, to ensure air circulation below, and to allow the water to drain out of the pipe. [*See also* COOLER (PROVISION)]

ICE PITCHER. Place a sheet of cotton-wool ½ in. thick between two sheets of brown paper, and sew two sides together to form a cylinder. Paste a top on, so that a box will be made like a silk hat without a brim. Place this over the jug, in which the ice drink is. It must be low enough to rest on the table, and pasted at the joints to exclude all air.

ICE: TO STORE. (1) Level the ground anywhere, but preferably on a slight slope in the shade, and cover 2 ft. deep with sawdust. Lay the ice-blocks on the top of each other in the form of a square, and enclose with any old boards, leaving 2 ft. between the ice and the inside of the boards. Then fill up this gap with sawdust, and then cover the whole with 2 ft. more sawdust on the outside. (2) To store a small quantity of ice, wrap it up in a blanket, and hang it up where the air is cool and still. (3) Make two pockets of coarse woollen cloth, one about 3 or 4 in. smaller each way than the other. Place the smaller one inside the other, and pack between them with feathers. Place the ice inside, tie tightly round the top, and suspend in cool, still air.

INK: BLACK. *Copying:* Steep and dissolve ½ lb. gum-arabic, ½ lb. copperas, ½ lb. sugar and 1½ lb. powdered nut-galls in 4 lb. soft water. Leave for from one week in summer to two months in very cold weather; shake up occasionally, and then strain.

Indelible: (1) Dissolve 1 part aniline black crystals in 30 parts alcohol, and then add 30 parts glycerine. (2) Dissolve 1 part asphaltum in 4 parts turpentine, and if necessary, add printer's ink to temper. (3) Mix 2 parts powdered acetate of copper, 4 parts sal-ammoniac, 1 part lampblack and 20 parts water. Shake before using.

Powder or Travellers': Mix 4 oz. powdered logwood extract, 12 oz. copperas, 1 lb. powdered nut-galls and 2 oz. gum-arabic. Add water to a portion of the powder to make ink as required; the above quantities will make 1 gal. ink.

Writing: (1) Add 4 oz. logwood extract to 5 gals. boiling water, and when dissolved, take it off the fire and add ½ oz. bichromate of potash and 50 grs. prussiate of potash immediately. Leave to cool, and strain. This makes the ordinary "commercial writing fluid". (2) Mix 15 parts powdered nut-galls, 5 parts ferrous sulphate, 4 parts iron filings, ½ part indigo, 3 parts sulphuric acid and 200 parts water. Leave to steep for from one to two weeks in summer and from one to two months in winter, shake occasionally, and then strain. This makes the "blue black" ink.

INK: BLUE. *Indelible:* (1) To 5 parts oxide of molybdenum add hydrochloric acid till it is dissolved. Dissolve 2 parts extract liquorice and 6 parts gum-arabic in 200 parts water. Mix both solutions together. Write with the ink, and when dry, moisten the places written on with a diluted solution of chloride of tin. This makes a good marking ink. (2) Dissolve 1 dr. crystallised nitrate of silver in 3 drs. ammonia water. Dissolve 1 dr. crystallised carbonate of soda, 1½ drs. powder gum-arabic and 30 grs. sulphate of copper in 4 drs. distilled water. Mix the two liquids together. (3) Dissolve 1 oz. iodide of potassium and 6 drs. iodine, in 4 oz. water. Dissolve 2 oz. ferrocyanide of potassium in water. Mix the two solutions together, when a blue precipitate should fall. Filter the precipitate off, and dissolve it in water. This precipitate dissolved in ordinary writing ink makes it indelible.

Writing: Mix and thoroughly pound 6 parts Prussian blue and 1 part oxalic acid; then add enough water to bring it to a paste, and leave for a few days. Mix a little gum-arabic with water, and add this to the blue paste till of the required shade.

INK: BONE. Mix 1 oz. powdered blue copperas and ½ oz. powdered sal-ammoniac in 2 oz. dilute acetic acid, and then add the pigment, such as vermilion for red, or lampblack for black. (2) Dissolve 1 part copper in 10 parts nitric acid, and dilute with 10 parts water.

INK: GOLD. (1) Mix equal parts iodide of potassium, iodide of lead and acetate of lead, and place them on a filter. Pour 20 times the quantity of warm distilled water slowly over, and as the filtrate cools, golden scales will separate out. When cold, wash the golden scales with cold water, and then grind them up with mucilage, and bottle. The bottle should be shaken before use. (2) Mix gold dust [*see* GOLD POWDER] with thin gum-arabic water.

INK: GREEN. (1) Dissolve green aniline dye in hot water, and add a few drops of clove oil. (2) Steep the inner bark of black oak in water till of a strong yellow, and then add blue ink till of the required shade. (3) Mix alum in a saffron solution, and add blue ink till of the required shade.

INK: HECTOGRAPH. (1) Dissolve 1 part aniline violet in 1 part alcohol and 7 parts water. (2) Dissolve 3 parts aniline violet in 3 parts glycerine, 20 parts water and 1 part alcohol. Violet ink is best for ordinary use. (3) Grind up in 10 parts water and 27 parts glycerine 3 parts aniline blue (blue), or 2 parts diamond fuchsin (red), or 2 parts eosin (red), or 4 parts methyl green (light green), or 5 parts vesuvian (brown), or 4 parts nigrosin (blue black), and then add 10 parts acetic acid and 10 parts alcohol.

INK, INDELIBLE OR MARKING: TO REMOVE. (1) Stretch the marked portion over hot water, and then put on some tincture of iodine. (2) Wet the marked portion with chloride of lime, and when the ink turns white, wash the fabric in ammonia water or hyposulphite of soda, and then rinse in clean water.

(3) Soak the marked portions in a strong solution of potassium cyanide, and when the ink is removed, thoroughly wash. (4) Mix 1 part corrosive sublimate and 1 part sal-ammoniac in 50 to 100 parts water.

INK: INVISIBLE. (1) Dissolve chloride of cobalt, nitrate of cobalt or chloride of copper in gum or sugar water. Develop by warming. (2) Mix 1 part linseed oil, 20 parts ammonia water and 100 parts water. The writing becomes visible on immersing in water, but invisible when dry. The ink should be shaken before use. (3) Milk. Develop by heating. (4) Lemon juice. Develop by heating.

INK LOOK OLD: TO MAKE. Infuse 1 dr. saffron in 1 pt. ordinary black ink.

INK MOULDING: TO PREVENT. Add two or three drops of carbolic acid to ½ pt. of the ink.

INK: RED. *Copying:* Dissolve 1 oz. fuchsin in 30 oz. water, and add 1 fluid oz. glycerine or 10 drs. gum-arabic, and a few drops of creosote.

Indelible: Dissolve 1 part platinic chloride in 6 parts water. Before writing on the fabric, size with a weak solution of gelatine, and then iron. After the writing has become dry, brush a weak solution of iodide of potassium over the marks.

Writing: (1) Steep 8 oz. bruised cochineal in 1 gal. boiling water, and leave for two days. Boil 8 oz. Brazil wood in 2 gals. soft water, and leave for two days. Mix these two liquids together, and then add 2 oz. gum-arabic dissolved in 1 qt. water. (2) Mix 2 grs. carmine in ½ oz. soft water, 20 drops ammonia and a little gum-arabic. (3) Dissolve 1 dr. saffranin in 1½ oz. warm glycerine; then stir in 1½ oz. alcohol, 1½ oz. acetic acid and then 1¼ lb. water.

INK: RUBBER STAMP. Dissolve 90 grs. aniline dye, preferably violet, in 1 oz. boiling water, then add and mix ½ teaspoonful glycerine and ¼ teaspoonful treacle.

INK: TYPE-WRITER. Mix 13 oz. resin in 1 lb. rosin oil, and then add 1½ oz. soft soap. Colour with vermilion lampblack or any good and fine pigment.

INK: VIOLET. *Copying:* Dissolve ½ oz. methyl violet in 1 lb. water, and then add ½ fluid oz. glycerine or 10 drs. gum-arabic and a drop or two of creosote.

Indelible: (1) Moisten the part of the fabric which is to be written upon with a solution of chloride of tin, and dry; then write over with chloride of gold. This gives a golden purple tint. (2) Dissolve 3 drs. carbonate of soda and 3 drs. gum-arabic in 1½ oz. water. Moisten the part of the fabric, which is to be written upon, with this solution, and then dry and iron. Dissolve 1 dr. platinic chloride in 2 oz. water, and write with it. When dry, paint over with a goose feather dipped in a solution of 1 dr. protochloride of tin in 2 oz. water. This gives a red purple tint.

Writing: Place 8 parts logwood in 64 parts water, and boil down to half its original volume. Strain, and add 1 part chloride of tin.

INK: WATERPROOF. (1) Boil ¾ to 1 oz. lump borax in 1 pt. clean water, and when it is dissolved add 1 oz. bleached shellac in powder. Stir up well, and when dissolved add any pigment required. In 2 hrs. strain and bottle. This is useful for outdoor writing, and is really a thin varnish.

INK: ZINC. (1) Dissolve 1 part copper sulphate or 1 part platinium chloride and 1 part gum-arabic in 12 parts distilled water; add lampblack if required to make more prominent. Clean the zinc first with dilute hydrochloric acid and sand, and write with a quill

pen. (2) Mix 2 parts verdigris, 4 parts sal-ammoniac and 1 part lampblack with water to a paste; then add 20 parts water. This receipt as well as No. 1 is used for writing on garden labels, etc. (3) Dissolve sal-ammoniac or muriate of ammonia in strong vinegar.

INLAID WOOD: IMITATION. (1) Cut out the desired pattern from shavings with a pair of scissors, and glue them on to a board of soft wood. Roll with a rolling pin, while the glue is soft, applying as much pressure as possible. If done carefully, and thin shavings be used, the shavings will sink down flush with the soft wood. When dry, coat with best copal varnish, and leave for about three days to dry. Rub down with finest emery powder; give another coat, and leave for five days to dry. Then rub down with the finest emery powder, then tripoli, putty powder, and finally polish with the palm of the hand. (2) Trace the desired pattern on a firm piece of white wood such as holly, and cut along the lines with a thin-bladed sharp knife a little way in. Fill up all the thin gaps with cement, or a composition of varnish and lampblack. Then stain the separate portions as desired; the cement will prevent the stain running from one section to another. When dry, rub down with the finest sand-paper, and stain again. Finally varnish or polish. Sœhnée or copal varnish will be found very satisfactory.

IRON: HOW TO BLACKEN. (1) Add strong sulphuric acid slowly, and stir it into turpentine till a syrupy precipitate is formed. Wash this syrup repeatedly with water till no trace of acid is left, and then filter through charcoal. This syrup should now be thinned with turps to the required consistency, and applied as paint. It should then be burnt in immediately with a gentle heat. When cool, polish with a woollen cloth and linseed oil. (2) Boil sulphur in turpentine, and apply with a soft brush. When dry, heat over a clear flame. (3) Heat the metal in a fire, and then rub over with a piece of cow horn or dirty oily waste. (4) Grind lampblack with turps, and add the smallest amount of oil gold size. This black is usually applied to small work and instruments.

IRON: HOW TO BROWN. (1) (*a*) File up the iron or steel smooth, using the file lengthways, known as "draw-filing"; then rub with three or four emery cloths, finishing with No. 000 to a glass polish. Rub off all grease with a piece of rag, and then drive a piece of wood into some convenient hole, leaving about 6 in. or so projecting for a handle. The metal must not again be touched with the hands, or come into contact with any grease till after the final oiling. Now mix unslaked lime with water to a thickish cream; cover the metal with it, and leave to dry. Instead of covering with the lime, the metal may be boiled for some time in soda water, or treated by any method which will thoroughly remove all grease. Mix ½ oz. tincture of steel, ½ oz. spirits of wine, ¼ oz. nitric acid, 1½ drs. corrosive sublimate, 3½ drs. sulphate of copper, and 1½ pts. soft water, and keep it in a glass-stoppered bottle. Fix a small sponge the size of a walnut in a piece of split wood, and pour out enough of the liquid into a saucer to thoroughly dampen the sponge. Brush off the lime from the iron or steel, or hold it in front of a fire to evaporate off the soda water, and when dry brush down with a file card or scratch brush. Dip the sponge in the liquid, and give even strokes up and down, completely covering the metal. Place the metal in front of a fire, or in some dry place at

a temperature of from 60° to 80° Fahr., and leave for 12 hrs. Now rub up and down with a piece of scratch card with light but sharp strokes. Then pour boiling water out of a kettle over the metal, letting the water run down it, and covering every part. Now scratch brush again, and leave to drain and cool. Then give another application of the mixture with the sponge, and leave in a warm place as before for 6 hrs.; then scratch brush. Give another application of liquid, stand for 6 hrs., scratch brush, scald and scratch brush again. Give a fourth coating of the mixture, stand for 6 hrs. and scratch brush. Give a fifth coating of the mixture, stand for 6 hrs., scratch brush, scald and scratch again. In most cases this will be enough, but if not give a sixth coating, dry, scratch, scald and scratch again. The metal should now appear with a sort of soft brown burnish, which on being rubbed over with an oily rag completes the process. This is the method usually adopted for browning the barrels of fowling pieces. (*b*) Make the mixture the same as in (*a*), but leave out the corrosive sublimate. Then proceed as before, the only difference being that the metal must be boiled in water for 20 mins. instead of pouring the boiling water over it. This method gives the very dark brown surface often seen on the barrels of rifles. (2) Dissolve 2 parts crystallised chloride of iron, 2 parts chloride of antimony and 1 part gallic acid in 4 parts water. Apply the solution with a sponge, and leave it to dry in the air before applying the next coat, three or four coats being usually required. When of a sufficient depth of colour, wash with water, dry and rub over with linseed oil. The chloride of antimony should be as little acid as possible. (3) Remove all grease with potash water. Dissolve 1 oz. blue vitriol in 4 oz. water, and then add 1 oz. nitric acid and 1 pt. water. Warm the mixture slightly, and apply it with a sponge. Leave for 12 hrs. in a warm place, then brush lightly with a wire brush and apply another coat. Leave for 12 hrs., brush and apply a third coat. Brush with a stiff hair brush and varnish. (4) Mix chloride of antimony with olive oil to the consistency of cream. Warm the metal and apply the mixture. Leave on till the browning is of the required shade. A few drops of nitric acid may be added to the mixture, which will hasten the process.

IRON: HOW TO BLUE. (1) To blue large articles, such as the barrels of revolvers, first give a glass polish, and then remove all grease. Make a pan from a piece of iron plate, say 3 in. larger each way than the article to be blued; fill it with charcoal and place it over a medium fire, letting it get black, but not red hot. Rub the piece of metal to be blued with dry lime on a cloth, care being taken that the hand does not touch it from this first application till completion. Now bury it in the hot charcoal, and after 10 to 15 mins. take it out with a pair of tongs to see how it is progressing. Rub down with dry lime and a cloth as before, and bury it again in the charcoal. Take out the metal periodically every 10 to 15 mins., and each time rub it down with dry lime. When examining it, do not keep it in the air longer than necessary and so let it cool. The steel or iron will turn blue almost immediately, but this must be allowed to pass off, and the metal turn bright again; the second bluing is the true colour. The longer the metal is in the charcoal the deeper and more permanent the blue will become. When of the desired tint, rub down briskly with oil. (2) To colour small steel

articles, such as screws and springs, first remove all grease. Half fill a pan with fine white sand, and place it over a fire. Keep running a bright needle into the sand, and when it turns the needle to the desired colour, take the pan off the fire, level the surface, and half cover the articles to be coloured in it. Place a small pair of tongs in the sand, and replace the sand bath on the fire. When the article turns to the required shade, take out the hot pliers, grip the article with them, and whirl it round in the air.

IRON: HOW TO TEST. To test wrought iron heat it to cherry red, and plunge it into water at 82° Fahr. The bar should then not crack anywhere on being bent cold over a round bar equal in diameter to twice the thickness of the iron. To distinguish between wrought iron and mild steel, file a bright spot on the metal, and place a drop of nitric acid on it, and leave for a few minutes. The spot will then appear ashy grey on wrought iron, brownish black on mild steel, and deep black on cast iron.

IVORY: TO CLEAN. (1) Boil the ivory in a concentrated solution of rock alum for about 1 hr., taking it out from time to time, and cleaning it with a soft brush. Then place it in a damp cloth, and leave to dry. (2) Steep the ivory in ether or benzol, then wash, and then bleach in a super-oxide of hydrogen. [*See also* BLEACH BONE (HOW TO) and BONE (HOW TO CLEAN)]

IVORY: IMITATION. (1) Mix ivory powder, bone powder or egg shells with water and grind to an impalpable powder in a mortar. Evaporate off the water, and mix glycerine and gelatine or glue with it to form a putty; a little yellow or brown may be added if necessary to give an old appearance. Press this putty well into a previously-oiled mould, and leave to dry; if possible dry at a temperature of 140° to 160° Fahr., under pressure. (2) Wash sound unbruised potatoes in dilute sulphuric acid till clean on the surface, and then boil them slowly in fresh dilute sulphuric acid till quite thick—almost solid. Wash them in tepid water, and then in cold till free from acid, and dry in a warm place. (3) Mix powdered ivory, bone or egg shell with 10 parts diamond cement and 1 part glycerine. These imitations may also be used for repairing and filling up cracks in ivory.

IVORY: HOW TO SILVER. Immerse the ivory in a solution of nitrate of silver, and leave it till it is of a deep yellow colour. Take it out, and immerse it in clear water, exposing it in the water to the direct rays of the sun equally on all sides, by turning it round now and again. In 3 hrs. the ivory will have become black. Then take it out, and polish to silver.

IVORY: TO TEST. Apply a drop of concentrated sulphuric acid to the ivory, and leave for about ½ hr. If the ivory be pure, it will remain unchanged; if imitation, it will turn pink.

JAPAN METALS: HOW TO. Japans are really only varnishes made from various gums and resins. After the japan has been applied as ordinary varnish, the metal is placed in an oven and heated to about 250° to 300° Fahr., at which temperature all volatile liquids are driven off, and only the hard portions of the gums and resins are left, which melt and thoroughly fuse together, forming a hard and glossy surface. The metal must first be thoroughly cleaned, and then from 1 to 6 coats of japan are usually given, each coat being stoved and rubbed down with pumice powder and water before applying the next.

A clear finishing coat is usually applied at the end over coloured ones. For japans *see* VARNISH (JAPAN).

JAPAN WOOD: HOW TO. The pores of wood or other porous materials must first be filled with plaster of Paris, as if it were going to be polished, and then rubbed down till smooth with pumice stone. The wood is treated exactly as metal, but the stove should be only at a temperature of from 135° to 175° Fahr. If the surface is to be coloured, the wood may be stained, or coloured japans used. To japan a tea-tray, dissolve white beeswax in turpentine till as varnish, and then mix sufficient flake white with it to give it body. With a fine brush paint over the required design on very smooth white wood, leaving only the background untouched. When dry dress over the whole surface with two coats black paint. When this is dry, brush over the whole pretty hard with a bristle brush dipped in spirits of turpentine. The white wax will then be removed, leaving the original design free, but with the background covered with black paint. It should now be varnished with clear japan, stoved, and then rubbed down with pumice powder. Then give another coat of japan. Sealing-wax varnish may be substituted for the black paint, or put on before the black paint, to vary the colouring.

JARS: HOW TO CLEAN. (1) For sweet-meat jars, pour in hot water and a tablespoonful of pearl-ash or strong hardwood lye. For cooking utensils, use strong hard wood lye. (2) Stone jars may be filled with earth and buried for 2 or 3 weeks.

JOINT: DOVETAIL. Mark off a series of quadrilateral figures on the end of the wood, as shown by the full lines in Fig. 1, the dotted lines representing lines which have to be drawn on other parts of the wood, which cannot be seen, so the wood must be imagined to be made of glass. First draw (ab) at about 80° with the edge of the wood; mark off (bc) from $\frac{1}{8}$ to $\frac{1}{4}$ of the thickness of wood; draw (cd) at 80° with the edge, as for (ab). Then on the flat surface of the board draw (xy) parallel to the edge, and making (xz) slightly greater than the thickness of the wood. Drop perpendiculars with a square from (*a*), (*d*) and (*g*), etc., on to

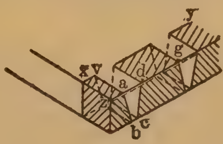


FIG. 1.

(xy). Draw another line on the other side of the wood exactly underneath (xy), and drop perpendiculars from (b), (c), etc., on to it in the same way. Now cut out the shaded portions, and the board will then appear as the lower board in Fig. 2. To cut out these pieces, saw down (ab), (cd), Fig. 1., etc., with a tenon saw on to (xy), and then cut down (xv) with a chisel, first working from the top,

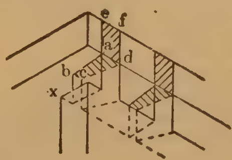


FIG. 2.

and then cutting from the line drawn below (xv) till the portion shaded drops out. The chisel may be held slightly slanting towards the board, so that the edge along (xv) is left sharp. In a similar way all the shaded portions may be cut out. Now hold it against the board it is to be jointed to, as shown in Fig. 2. Mark with a pencil all round each tooth (abcd), and then draw

(ae) and (df) with a square. Cut down (ae) to (b), and down (df) to (c), and then with a chisel nick the shaded part out, so that the tooth can fit in. The other portions shaded

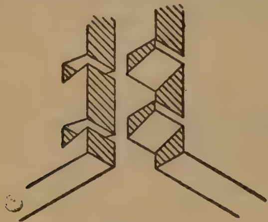


FIG. 3.

should be cut out in a similar way. The two pieces will then appear as shown in Fig. 3. Drive these two together with glue, and when the glue is set plane off any projecting portions of the teeth. Fig. 4 shows

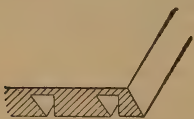


FIG. 4.

a lap dovetail or secret dovetail joint, because the joint can only be seen from one side. This latter joint is used for drawers, etc., where one surface must have a good appearance.

JOINT: HALVED. The ordinary halved joint is very easily

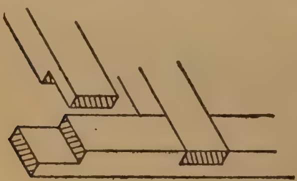


FIG. 1.

made, Fig. 1 being self-explanatory. On the left the wood is shown as it is cut; on the right the wood is shown jointed together. It is chiefly used for outdoor work, in making the framework for sheds, etc. Fig. 2 shows a joint which is a combination of the mitre and

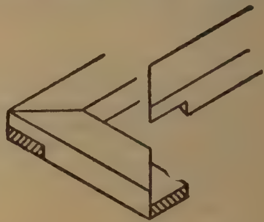


FIG. 2.

simple halved joints, and is known as a "mitred halved angle joint". The wood on the right is shown ready to fit into another piece; on the left a view of the joint fixed in position is given. This joint is not

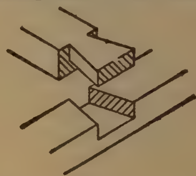


FIG. 3.

really as strong as the ordinary halved mitre joint, but as it requires more care to make, the joint is usually as strong for that reason. This joint also is very neat. Fig. 3 shows a dovetail halved joint, which is very strong if well made.

JOINT: MATCH. This joint is usually employed for making water-

FIG. 1.

FIG. 2.

tight walls with thin boards, or for making one board slide on another. Fig. 1 shows a section of two boards

fitted together. As the price of these boards is hardly more than planed boards, it does not as a rule pay to make this joint. For very small work, however, it is easiest for the amateur to groove two boards [*see* GROOVING AND REBATING], and then glue them together with a feather, as shown in Fig. 2.

JOINT: MITRE. Cut and plane up the pieces of wood as shown in Fig. 1, and then glue and nail them together. For further details of making *see* FRAME (PICTURE: *Mitre Joint*). When the joint is glued together, a saw kerf may be sawn down, and then a piece of veneer

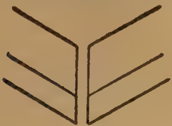


FIG. 1.

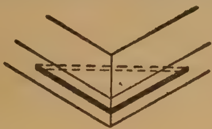


FIG. 2.

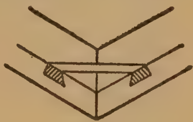


FIG. 3.

glued in to strengthen it, as shown in Fig. 2. Another way is to cut out a taper slot, and fit and glue in a key of some tough wood as shown in Fig. 3. The open tenon and mitre joint is a combination of the open tenon and mitre joints as

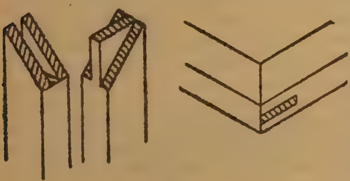


FIG. 4.

shown in Fig. 4. This hardly needs any explanation, the illustration showing its construction. On the left the wood is shown ready cut for jointing, and on the right the joint completed. The joint is very neat, but not so strong as an open tenon.

JOINT: RULE. This joint should not be attempted without suitable tools, and even then it is a very

FIG. 1.

hard joint to make neatly. Fig. 1 shows the joint as applied to a table, the flap down; Fig. 2 shows the joint, the flap up. The end of the piece which is horizontal in Fig. 1. should first be planed up a true quadrant of a circle with a ridge on the top for the top edge of the

FIG. 2.

piece hanging down to butt against. Then groove out the piece hanging down with a plane to fit approximately. Cover the working surface of the quadrant of the circle with graphite, and then rotate the piece grooved out on it to find the hard places. Plane out the parts marked on the groove, and then rub it again on the quadrant, and plane out again. Repeat this as often as necessary till the two pieces bed well together. Then buy hinges, which are specially made for this joint, clamp the two pieces of wood together as shown in Fig. 2, and

screw the hinges in place. Then see that the joint works well, and if necessary ease the quadrant where it sticks. Then place as in Fig. 2 again, and plane up the top surface perfectly flush.

JOINT: TENON. Square the two pieces of wood A and B, Fig. 1. Suppose the sticks to be 1½ in. square. With a scriber and square mark off two lines (aa), (bb) (which go all the way round) on the surface of the stick to be mortised, just as wide apart as the breadth of the tenon, *i.e.*, 1½ in. Mark off a line (gg) all the way round the stick to be tenoned, making the distance from the end about ¼ in. more than the line (ff) was marked. With a ⅜ in. bit bore between the gauge marks (cc), (dd) a row of holes, but sink the holes only half through. Turn the wood over, and bore from the opposite side to meet the first row. Now cut out the mortise bounded by (cc) (dd) with a ⅜ in. chisel half-way through, then turn the wood over, and work from the other side, and finish up the long sides with a broader chisel. The mortise may be slightly undercut. Run a fine tenon saw down the inside of the lines, cutting out the shaded parts of the tenon sticks; then finish off smoothly with a chisel. Chamfer the end corners of the tenon, and

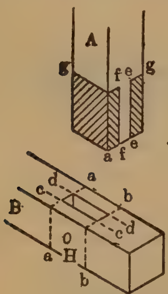


Fig. 1.

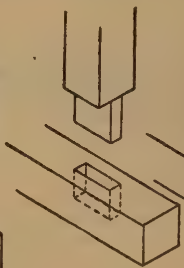


Fig. 2.

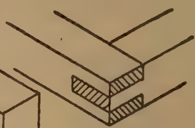


Fig. 3.

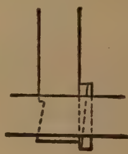


Fig. 4.

the depth of the mortise, *i.e.*, 1¾ in. With a pair of dividers divide the face on one side between the two lines on the mortise into three equal parts, *i.e.*, each division will be ½ in. broad. Set the guage to the first mark, and draw through marking the line (cc); make a similar mark on the opposite side of the stick. Without altering the set of the gauge, mark off the line (ff) on the two sides and the end of the tenon. Now set the guage to the other mark or 1 in. from the edge, and draw through making the line (dd), also mark off a similar line on the opposite side of the stick, as before. Now mark off the line (ee) as try if it can be driven into the mortise. If not, take it out, and remove the parts which show they have been squeezed. When the tenon fits in tightly up to the shoulder, run the tenon saw down between the shoulder and mortise on both sides, taking care not to go beyond the gauge lines. Knock apart a little to see that the shoulder is cut quite down, blow out the dust, and drive home again. If all fits well, knock the tenon out, and bore a ¼-in. hole (H) through the mortise from side to side within 1 in. of the shoulder edge. Drive the tenon up snugly again, and prick holes upon the tenon through the

holes (H) completely around the circle. Knock apart, and bore with the same bit at the point where the marks are made, but $\frac{1}{16}$ in. nearer the shoulder. Now cover the joint with white-lead paint, and put together for the last time. Make a taper ash pin, slightly over $\frac{1}{4}$ in. at its thick end and 3 to 4 in long. Drive the pin through the hole in the joint, assisting it by hammering the mortise down on to the tenon between each blow. Now cut the pin off flush on both sides. Cut off the $\frac{1}{4}$ in. of tenon projecting beyond the mortise, and plane all flush.

Stump mortises and tenons are those in which the wood is not cut right through in the mortise, as shown in Fig. 2. The open tenon is shown in Fig. 3. This is a tenon at the ends of two pieces of wood, and is a step between the halved joint and the tenon joint. Fig. 4 shows a dovetail mortise and tenon. This joint is very strong if well made, but not stronger than the ordinary tenon joint. Its advantage is that the joint is readily taken to pieces by driving out the two small wedges shown at the right in the mortise.

JOINT: TONGUE AND GROOVE. This joint is shown in Fig. 1, where the two pieces of wood to be joined together are separate. The illustration also

FIG. 1.

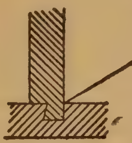


FIG. 2.

shows two pieces joined together in two positions, one in the centre and the other at the edge. To cut the grooves *see* GROOVING AND REBATING. This joint is often used for small chests of drawers, cameras, etc. A wedge-shaped variety, known as the dovetailed tongue and groove joint, is shown in Fig. 2. This joint is slightly stronger than the plain groove and tongue joint, but as a dovetail joint should be used where strength is required, it is not much of a recommendation. It is also very hard to make neatly without special tools.

KENNEL: DOG. (1) Cut two boards from 1-in. deal 10 in. × 3 ft., and glue them side by side to make the floor 20 in. broad × 3 ft. long. Nail two cleats 6 in. wide on the bottom, and about 6 in. from either end, and clinch the

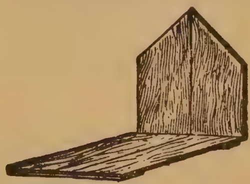


FIG. 1.

nails. Square off one end of a $\frac{3}{4}$-in. board 10 in. broad. Measure up one side 27 in., and up the other side 18 in.; join diagonally across, and saw off. Saw off three more pieces exactly similar. Glue two side by side, the peaks together, to form the back end, and nail it on to the floor boards, as shown in Fig. 1. Repeat for the front end, having first cut out the door hole. Place a ridge pole of 2-in. square board from the apex of the front to the apex of the back end, and plane it, so that the roof will lie flush on the top of it; then screw it in place. Fit two similar poles from end to end, to nail the top of the sides and the bottom of the roof on to. Make the roof and

sides from ¾-in. match-boarding, and cut the roof so that it will lap over the ends and sides at least 3 in. to form eaves. Felt may be

FIG. 2.

nailed over the roof and covered with tar to make it waterproof. [*See* TAR PAINT] (2) A good kennel may be made from an old barrel with one end left open.

leaves, which must be quite dry, and chop them up very small; roll them up in a cloth, and hammer them with a mallet till all the pieces are thoroughly bruised. Then place enough in to fill up 1 in. of the bottle. Cut out a sheet of cardboard so that it is a tight fit in the bottle, and will not slip, up or down, and press it down on the top of the bruised leaves.

KITE: BIRD. Split strips ⅛ in. sq. from strong bamboo, and bend and tie them in place as shown in Fig. 1. Make the centre stick 15 in. long, the centre bow 18 in. long, bent to spread 4½ in. wide at the widest part, the top being 2 in. below the top of the centre stick.

FIG. 1.

FIG. 2.

KILLING BOTTLE. (1) Fill up a large-mouthed glass bottle, such as a French plum jar, one-fifth full with lump cyanide of potassium, and cover with a layer of plaster of Paris. Shake and twist the bottle round, while the plaster is setting, to get an even surface. Cut out a circle of thick white blotting-paper to fit tightly over the plaster and press it down. Keep the bottle corked with an air-tight cork. [*See* CORK (WATER-TIGHT)] This bottle tends to set the insects, and to keep them relaxed; chopped laurel leaves should be placed on top, as explained in No. 2. (2) Pick a quantity of young laurel

Make the side bows or wings of two sticks, each 10½ in. long. Bend and tie with fine thread as shown, so that at the widest part they spread 4½ in., and where they join the centre stick they spread 1½ in. Cut out the body part from coloured paper 14 in. long and a little wider than the centre bow; the tail part to be left self-supporting. The paper should be thick enough to prevent the tail doubling back in a strong breeze. Paste on to the frame. Make the wings of slightly thinner paper. Paste them on to the centre hoop, and cut to conform to the shape of the side bows at the base, but leave the

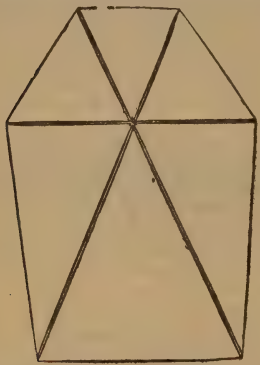
outer end 4½ in. wide, and cut square across. Double the outer edge in the centre, and bring up to the side bows. Paste the paper on to the frame, and trim off. Do not paste the folded outer edge except at the corners, for the openings must be left for the air to escape in a strong breeze. The head should be made of light paper, and of any shape to suit the taste. On the paper side punch a hole at the crossing of the centre stick and the centre bow, and another 4½ in. below the first. Tie a linen thread 10½ in. long through these holes for the belly-band, and attach the running line to the band with a slip knot.

KITE: BOW. Split two strips ⅛ in. sq. from strong bamboo 30 in. and 40 in. long or in the same proportion. Bind the centre of the 30 in. strip for the bow 1 in. below the top of the centre 40 in. strip, and bring the ends of the bow 10 in. on each side away from

the centre strip. Attach them together with strong thread, and give the thread a twist round the centre strip to keep all in place. Small notches may be cut in the sticks where the thread is attached, and where it is twisted round them. Tie a thread to one end of the bow, pass it round a groove cut near the lower end of the centre stick, and tie firmly; then pass the string up and tie it on to the other end of the bow. This completes the frame, as shown in the illustration. Lay down a sheet of light, strong paper, lay the frame over it, and cut the paper 2 in. larger all the way round than the frame. Bend the paper over the bow and side strings, and paste it on. Bore a hole 10 in. from the bottom, and another 10 in. from the top of the centre stick. Tie a strong thread slackly through the holes, to form the belly-band, and attach the running line to it with a slip knot. Cut strips of paper 4 in. wide × 6 or 8 in. long, and bend them backwards and forwards like a fan, for the tail. Attach 12 or 16 of them at their centres 3 in. apart to a string, and make a paper tassel about 6 in. long for the end of the tail. Attach the tail to the centre stick at the bottom. Tassels may also be hung from the shoulders. Another way is to attach a slack string to the shoulders of the bow and tie the tail on to the centre of it. Tassels at the shoulders should not then be used. If the kite plunges from side to side the tail is not long enough. If it will not rise the tail is too long, or the bow is not evenly bent, or the weight is not evenly balanced.

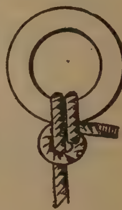
KITE: THREE-STICK. Make the sticks of light wood ½ in. wide × ⅛ in. thick. Cut two 30 in. long, and a third 20 in. long, and mark points 10 in. from the ends of the long sticks, and in the middle of the short stick. Cross all the sticks at the points, and bind them firmly in place. Cut notches across the ends of the sticks and tie stout twine all round, making a six-sided figure. Make the bottom 16 in. long, the sides 18½ in. long, the shoulders 11 in. long, and the top

8 in. long, Lay down a sheet of thin, strong paper, lay the frame on the top, and cut all round the paper about 2 in. away from the frame. Bend the paper over the twine, and paste it down, cutting away at the corners where the paper laps over itself. Bore two holes from each lower corner 5 in. up the sticks. Tie a string through these holes 14 in. long, hanging over the paper side. Bore two holes from each upper corner 3 in. down the sticks, and in a like manner tie



through them a string 8 in. long. Join the middles of the two loops with a string 20 in. long to form the belly-band. Hang the belly-band over the finger, and when the lower end rests on the ground and the top end is raised about 12 in., tie the line so that it will not slip to the part of the string resting on the finger. When the kite is in the air, it should rest at about 45°. If too vertical, raise, and if too horizontal, lower the point of attachment of the running line and the belly-band.

KNOT: BARKING BEND. This knot is also called the "Fisherman's Bend". It is usually employed for fastening light ropes to rings of about the same thickness. It is not very safe for a heavy strain, and in that case the "Lark's Head" should be used.



KNOT: BINDING. For short lengths of binding Fig. 1 is often employed. A loop is formed on one end of the string, and then the rest of the string is wrapped firmly round it and the wood. In the illustration the string is bound on from right to left. The other end of the string is then slipped through the eye that is made, and the first end of the string then pulled. When the loop and the other end of the string are about in the middle of the binding, the ends are cut off flush. This can only be used for short lengths of binding, or where the binding is not very long, because the friction would otherwise prevent the loop being moved. Fig. 2 shows the method employed for long or very tight bindings. The binding here

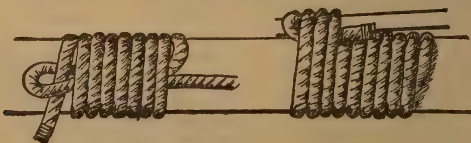


FIG. 1 FIG. 2.

illustrated is being bound from right to left. The first end is held by four or five wraps, and then cut off; the binding is then continued for any length. To finish off the string is wrapped for a few

turns over a second piece of wood. This piece of wood is then withdrawn, and the end of the string threaded through the hole thus left. The binding is then wrapped over the end, and the end is then drawn through tight, and cut off flush. Fig. 3 shows a cheap tool commonly employed for binding with soft or annealed wire. The illustration shows how it is made. It need not be more than 6 in. long × 1 in. thick and 2 in. wide at the

FIG. 3.

top. A slot is cut out of the top, and the two pieces left projecting support a small reel on which the wire is wound. Two or three small staples on the side guide the wire from the reel to the joint. Reel the wire on to the reel at the top, bring the end down through the staples, and attach it to the article to be bound; then by the crank hold the wire taut, and move the whole round the article to be bound, allowing the reel to unwind as the wire is used.

KNOT: BOAT. The knot is also called "Marline Spike Knot,"

etc. It is useful, because directly the piece of wood is withdrawn the knot straightens out. The bends in the rope are also not sharp.

KNOT: BOWLINE. The bowline is almost always used to tie a rope to a ring, etc., where an even strain on the rope is expected. The great advantage is that no matter how great the strain, immediately it is taken off the knot

FIG. 1.

FIG. 2.

can be undone, as it does not bind on itself. The loop made in Fig. 1, which is the lower loop in Fig. 2, prevents the knot from drawing. Fig. 1 shows the first step in tying the knot; Fig. 2 the knot complete.

KNOT: CLOVE HITCH. This knot is also called the "Builder's Knot," "Double Hitch," etc. It is

FIG. 1.

FIG. 2.

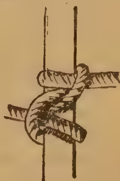


FIG. 3.

usually employed by builders, and it cannot come undone due to the friction of the parts. Fig. 1 shows

the loops which are slipped over the pole, and on the ends being pulled it assumes the hitch or knot shown in Fig. 2. Fig. 3 is called a "Double Clove Hitch," and is less liable to draw than the "Double Hitch." If the ends of the rope be knotted close down by the hitch, the knot is called a "Gunner's Knot".

KNOT: DOUBLE TIE. This knot is used for joining lengths or

light rope together. It is also the best knot for joining lengths of cat-gut for fishing-casts.

KNOT: ENDING. This is a quick method for ending off a rope, so that it does not unravel. The rope is first bound for an inch or so a few inches off the end. The strands are then separated out, and bound down on the rope, as illustrated. [*See also* KNOT (MANROPE)]

KNOT: ENGLISH. This knot is also known as the "Fisherman's Knot". It is used for joining lengths of light rope and string together, but is not suitable for heavy rope, as the bends are too

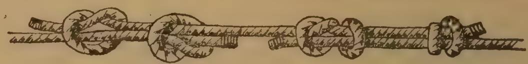
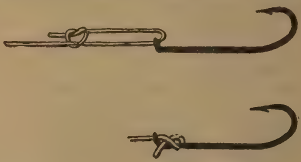


FIG. 1. FIG. 2.

sharp where the strain comes. Fig. 1 shows the knot with simple ties; Fig. 2 with double ties. This knot is often used for joining lengths of gut together for fishing-casts.

KNOT: HALF-HITCH JAM. This knot is commonly used for attaching eyed trout flies to gut



The figure above shows the way it is tied. The gut is first threaded and then tied as a simple tie over the cast. This knot is then slipped down over the eye, and on the cast being pulled it assumes the position shown.

KNOT: LARK'S HEAD. This knot is used for attaching a boat

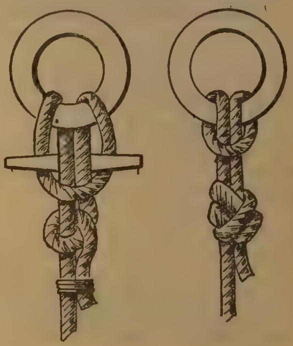


FIG. 1. FIG. 2.

to a ring, for anchors, etc. Fig. 1 shows a method which has the advantage that directly the pin is drawn out the knot is released. Fig. 2 shows the method often employed for attaching ropes to anchors.

KNOT: MANROPE. This knot is used for an ending, or where it is required that the end be the largest part, as the handle to a bucket. The rope is first bound some distance below the end, and the strands then separated out. They are then interlaced as shown in Fig. 1. The strands are then pulled to make the loops tidy, but leaving them quite loose, and interlaced again as shown in Fig. 2. The strands are then pulled up tidily again, and the rope then appears as in Fig. 3. The strands

FIG. 1.

FIG. 2.

FIG. 3.

are then brought down parallel with the last bends, and slipped under the first loops. For instance, the top right-hand strand in Fig. 3 is brought down sloping towards the left, and then under the loop in front. All is then pulled as tight as possible, working from the first bends, with a marlinespike, and the ends of the strands cut off.

FIG. 4.

KNOT: PIER BEND. Figs.

FIG. 1.

1 and 2 represent the usual method

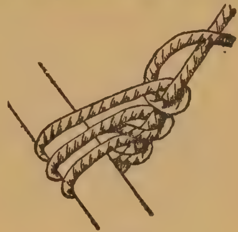


FIG. 2.

for attaching boats to posts or piers.

KNOT: REEF. This knot is also known as "True Knot" and "Sailor's Knot". If this knot be tied incorrectly it is called a

FIG. 1.

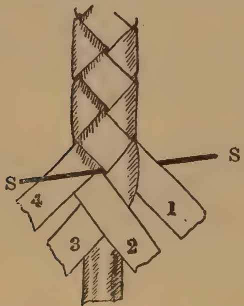
"Grannie". This knot is used for tying lengths of small ropes of the same diameter together, but it

FIG. 2.

should not be used for heavy ropes or ropes of different sizes. Fig. 2 shows a common method of uniting a cast to a fishing-line.

KNOT: SENNET PLAIT. This plait is used chiefly for making the square packing to glands on

engines, for plaiting round the core of a whip, etc. It can be made with any even number of strands,



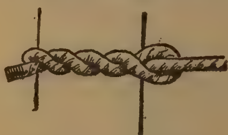
but six or eight give the best results. The illustration shows the plait with four strands round a core. 2 is held in the right hand, 3 is held in the left hand, and 1 and 4 allowed to hang loose. 4 is then passed behind, comes forward between 1 and 2, and is then brought down parallel to but below 3. 4 is then held in the hand, and 3 allowed to hang loose. 1 is then passed behind, between 3 and 4, across 4 (4 being now below 3), and then parallel to, but below, 2. 1 is then held in the right hand, and 2 allowed to hang free. 3 is then worked in the same way, then 2, and then 4 again, and so on till sufficient has been plaited. If it be required to plait six strands, two are held in each hand and one allowed to hang loose on each side. The loose strand on one side is then passed behind, between the other loose strand and the two held in the opposite hand, then back to the first hand making it the lowest. The top one is then made the loose one, and so on. In an eight stranded plait three are held in each hand. In plaiting a whip, when near the end thread through a piece of whip-cord (SS). Work one end down with 4, and one end down with 1. Gradually thin off 1 and 4 till they are ended, and let the whip-cord take their place. Then gradually thin down 2 and 3. When 2 and 3 come to an end, bind one end of the whip-cord round, and end off.

KNOT: SPLICING. The ends of the ropes are opened out and placed between each other as shown in Fig. 1. They are then interwoven as shown in Fig. 2.

FIG. 1. FIG. 2.

The strands of one rope are lifted up with a marlinespike, and the strands of the other drawn through as tightly as possible.

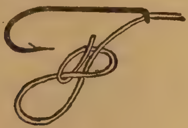
KNOT: TIMBER HITCH. This knot is also known as a "Slip Knot". This hitch or knot is held



fast by friction, and should therefore only be used when there will be a steady strain on the rope.

KNOT: TURTLE. This knot is used chiefly for attaching eyed salmon flies to gut. The hook is threaded through the largest loop

in the upper illustration, and when all is eased and pulled, the gut



takes the position shown in the lower illustration.

KNOT: WEAVER'S. This is a universal knot for attaching thin ropes of about the same thickness

together. It is a very common knot for anglers to use to attach the cast to the running line.

KNOTTING. Knotting is a method of covering over knots so that the resin shall not exude from the knots after the wood is painted. (1) Apply shellac varnish. (2) Gouge out each knot, and fill up with a mixture of glue and saw-dust. [*See* WOOD (GRAINLESS)] (3) Gild over each knot with gold leaf. (4) Mix equal parts red lead, glue and water, and apply hot.

LACE: TO WASH. (1) Wind a large bottle with flannel, baste on the lace, taking care not to pull it out of shape, and cover with more flannel. Prepare suds of good soap, and cleanse by passing the bottle through the suds, and by squeezing and patting the flannel. Change the water and repeat; then remove the outer flannel, and rinse in clean cold water. (2) Wash the laces in hot suds, and squeeze but do not rub them. Rinse in clean, hot water, and then wash again. Put ¼ oz. soda in 1 gal. of water (or use soft water), and boil the lace in this for ½ hr. Then wash again, and rinse in cold water. (3) For embroidery, lace handkerchiefs, etc., place in an open basin, and soak for 3 days. Then rub Castile soap on any spots, and set the jar over a fire so as to make the water come to a boil slowly. Rinse in cold water and then dry. To make the starch: (1) Make a thin starch, and boil till clear; a little spermaceti or white beeswax added forms a polish. (2) Dissolve 2 lumps sugar in a coffee cup. A little borax may be added if desired. To retain the colour of old lace add a teaspoonful of coffee. To iron: (1) Lay the lace on several thicknesses of flannel face down; cover with thin flannel and iron on this. (2) Roll the lace up in a towel and squeeze. Lay the lace on flannel, and have the iron as hot as possible. To retain the whiteness of newly-washed laces, place the laces in a box and powder with magnesia over them. Magnesia is also useful for removing oily stains.

Gold and Silver: Sew the lace on a clean linen cloth, boil in 1 pt. water and 2 oz. soap, and rinse in cold water. If tarnished, touch the dull places with alcohol.

LACTOMETER. Take a hollow glass tube with a bulb on the end, and load the bulb with shot till it stands upright in pure milk. Make a mark on the stem where the top of the milk rises to. Then put into water and make a mark on the stem where the top of the water rises to. Take a narrow slip of paper capable of being inserted in the tube. Lay off on this the distance between the two marks on the stem, and sub-divide into 10 or 100 proportional spaces. Number the first division 0, the last division 100. Insert the paper in the tube so that the 0 is at the

milk mark, the 100 at the water mark. The depth at which it floats will register the percentage of water added approximately.

LADDER: BUILDER'S. For the sides use straight-grained and well-seasoned deal. Fix two sides side by side, and mark off distances 12 in. apart for a long ladder, or where heavy weights are to be carried; 14 in. apart for a short, light ladder. Bore holes through both sides at these points. The holes may be afterwards rimered slightly larger on the outside of each piece. The rungs should be made of ash about ¼ to ½ in. bigger in diameter at the centre than at the sides. Cut the rungs with a shoulder to fit tight in the holes, and well up against the shoulder on each side. Take them out, and saw a slot in each end, and paint from the shoulders to the end with white-lead paint. Fit them all into one side, lay the other side on the top, and then insert wedges, and fix very tight. Cut off flush with the outside. If the ladder is to be 10 to 14 ft. long, make the sides 4 in. wide at the bottom, 3 in. wide at the top, and about 1¼ in. thick all the way up. Make the rungs from shoulder to shoulder from 22 to 26 in. at the bottom and from 15 to 18 in. at the top. The rungs may be fitted into 1-in. holes all the way up, or the top holes may be ¾ in. For a 14- to 20-ft. ladder, make the sides slightly larger in the middle; at the bottom about 4½ in. wide, in the middle 5 in. wide, at the top 4 in. wide, and about 1¾ to 2 in. thick all the way up. Make the bottom holes 1¼ in., and the rungs about 2 ft. 6 in. to 3 ft. from shoulder to shoulder. The upper holes may be 1 in. and the rungs 20 in. from shoulder to shoulder.

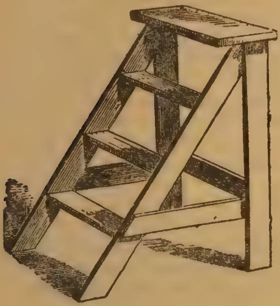
LADDER: FRUIT. (1) An ordinary ladder may be used with a double brace support as shown in Fig. 1. These braces are almost as long as the ladder, and can swing on a bolt passed through both near the top. Ten in. below the bolt a strong hook is fixed to each brace to support the ladder on the top or the next rung. (2) A double ladder, as shown in Fig. 2, may be made of 1 in. boards 5 in. wide. The pin, acting as the top rung, passing through both ladders, should be detachable, so that the ladders may be used for other purposes.

FIG. 1.

FIG. 2.

LADDER: STEP. Make the top or foot-rest 20 in. long × 9 in. wide × 1 in. thick. The legs straight 4 in. wide × 3 ft. long × ¾ in. thick. The step supports 5 in. wide × 3 ft. 8 in. long × ¾ in. thick. The side braces 1 ft. 10 in. long × 4 in. wide × ¾ in. thick. The back brace 18 in. long × 4 in. × ¾ in. thick. The ladder to be 18 in. wide. The steps 6 in. deep

× 18 in. wide × ⅝ in. thick are set out equally, and let into grooves



in the sides, or nailed firmly on to cleats.

LAMP: CYCLE. Cut the dead part off the wick perfectly level, and be sure it is in the oil. If the lamp does not then burn, soak a new wick in vinegar for 10 mins. Fill the lamp with good burning oil, which is sold exclusively for that purpose, and add a saltspoonful of paraffin and a small piece of camphor. Let the wick dry before placing it in the burner.

LAMP: SAFEGUARD FOR. Fill lamps which are liable to be upset or broken with cotton waste, and then fill up with oil. If the lamp be broken, the burning oil will not spread.

LAMP SHADE. Paste small bright autumn leaves on the inside of the opal shade, and arrange them in clusters or all the way round. To prepare the leaves *see* LEAF (HOW TO VARNISH) *and* LEAF (HOW TO WAX).

LAMP WICKS. Wicks should be renewed immediately they become dirty or clogged. If the oil be dirty, the wicks act as a filter. Wicks may be made of flannel folded over three times, and sown down each side. [*See also* LAMP (CYCLE)]

LAYER PLANTS: TO. *Roses:* Use shoots 3 or 4 weeks old. The cut should always be made at a part on the shoot where there are healthy green leaves below as well as above. Cut a slit like a tongue 1 in. long either on the top or the bottom of the shoot. Lay it down in a trench, peg it in place, and then cover with earth, leaving 3 or 4 in. of the end of the shoot out. If the season be dry, watering will be necessary.

Shrubs, etc. Shrubs can be more easily layered than roses. A branch that has a lot of young ones growing off will make a healthy layer. Carnations can be increased better by layering than by cuttings.

LEAF IMPRESSIONS. Thoroughly coat a sheet of well-calendered letter-paper with sweet oil; then wipe it dry and expose it to the air for a short time. Move the oiled paper horizontally over a candle, taking care not to burn it, till quite black. Lay the leaf on the blackened paper, cover with a piece of clean paper, and rub it with the fingers in all directions. Place the leaf on the paper upon which the impression is to be, cover with a piece of blotting-paper, and rub with the fingers as before. The impressions may afterwards be coloured. The blackened paper can be used a number of times.

LEAF: SKELETON. Gather the leaves in July or when in full vigour, and gather many more than are necessary, for more than half will be damaged in the preparation. (1) Make a strong solution of washing soda in soft water, throw the leaves in, and boil for 5 or 10 mins. When the pulpy matter rubs off easily take the leaves out of the kettle and place them in a basin of cold, soft water. Remove all the pulp from the leaves by a gentle rubbing motion between the

thumb and first finger, using only a slight pressure, and keep the leaf entirely under the water whilst under the operation. Float the skeletons over pieces of paper, lift them out, and bleach. (2) Place a layer of broken cabbage leaves in the bottom of a jar, the leaves to be skeletonised in a layer on them; and place a second layer of broken cabbage leaves over all. Fill up with water; cover over, and place in a shed in the sun, and leave for about a month. No new water should be added during that time. Then take out some leaves and test if they be rotten enough, as in No. 1; if not, make a new pot of broken cabbage leaves and fresh water, and immerse again. To prepare the bleaching liquid: Mix ½ lb. quicklime with 1½ pts. cold, soft water in an earthenware jar, and cover it up, leaving it to settle for ½ hr. in a cool place. Remove any scum there may be floating on the top with an iron spoon, and pour off the clear liquid into a bottle; cork tightly, and keep in a cool place. To bleach the skeletons, place them in a wide mouthed bottle, stem downwards, the coarse leaves in one jar, the more fragile leaves in another, and add 2 table-spoonfuls of the bleaching liquid to every pint of water. Cover the jar, and put the leaves to bleach in a warm place for from 30 mins. to 24 hrs. When the leaves are white, put them into clean water and rinse them several times; then leave them to soak in clean water for several hours. Float them over sheets of paper, and remove them, and then dry by pressing them between sheets of white blotting-paper.

LEAF: HOW TO VARNISH. It is best to wax the leaves [*see* LEAF (HOW TO WAX)], but if varnished, any leaves which are not to be pasted down should be ironed, and then varnished on both sides to prevent them curling. A branch of leaves for a vase should not be ironed, but only varnished.

LEAF: HOW TO WAX. Gather the leaves in autumn when red or yellow. To preserve them they may be varnished, but this renders the colours unnaturally bright, and they are liable to curl up. The best way is to rub a piece of bees-wax over the face of a warm iron, and then press it on top of the leaves. To imitate a butterfly, select large yellow or spotted leaves, and cut out the leaf from a print or the actual insect to shape. Use the centre vein or mid-rib for the body. After waxing, paste on to curtains, etc.

LEATHER: TO HARDEN. Extract all oil with bisulphide of carbon, and then immerse the leather in a hot concentrated solution of zinc chloride. Press and dry at about 220° Fahr.

LEATHER: OIL FOR. *Belts:* Apply castor oil sparingly to machine belts to prevent them cracking. The machine should not be used till 30 hrs. after the application.

Harness: Use (*a*) neatsfoot oil, (*b*) castor oil, (*c*) melt and mix 1 qt. neatsfoot oil, 4 oz. beef tallow, 3 tablespoonfuls lampblack, and if a good polish be necessary, 4 oz. beeswax. Apply the polish sparingly, and rub it well in with a piece of flannel, giving most to the buckle holes, girth, breechings and bit straps. [*See also* POLISH (LEATHER)]

Shoe: (1) To make shoe leather soft, thoroughly clean it with a damp cloth, and then give three coats of olive oil before the leather gets dry. Shoes, etc., should always be oiled after having been thoroughly wet. (2) For kid leather boots, melt ¼ lb. tallow in ¼ lb. olive oil, and apply sparingly, rubbing it in with a piece of flannel. If the boots be dirty, clean with

warm water, and apply the grease while the leather is wet.

LEATHER: PATENT. *Dressing:* Rub lightly over with castor oil or cream, and then polish with chamois leather.

Restoring: (1) Mix 1 pt. raw linseed oil, 4 oz. cider vinegar, 2 oz. spirits of wine, 1 oz. butter of antimony, ½ oz. spirits hartshorn, ½ oz. camphor and ½ oz. lavender. Apply with a soft brush, and rub in with cotton batting till dry. (2) Mix oil japan varnish with lampblack and a drier. Rub this mixture over the patent leather and polish.

LEATHER: RAW-HIDE. Cut the skin in strips, and shave the hair off close with a knife. The skin in drying shrinks, and so any dry cask, or splintered wood-work can be bound firmly by nailing the raw hide on while green. It may be made soft by rubbing it over the edge of a board, and it is then exceedingly strong.

LEATHER: TO RENOVATE. If the fancy leather-work be worn and rough, paint the damaged portions with weak gum-arabic; smooth down with a burnisher, and then varnish with Sœhnée No. 3, or some similar elastic varnish. To fill up holes and cracks, scrape a piece of spare leather with a knife; collect the dust, and macerate it with weak gum-arabic to a paste about the consistency of butter. Plug up the holes, or cement down tares with this paste; smooth down with a pen-knife, and when dry cement with Sœhnée No. 3. This leather paste may also be made by first softening leather with water, and then macerating it with weak gum-arabic in a mortar. To cement leather *see* CEMENT (LEATHER), and GLUE (LEATHER TO METAL). If new leather be sticky, beat up the white of eggs; leave it to stand, and then pour off the clear liquid. Mix with this liquid a little ox-gall, and apply with a soft cloth.

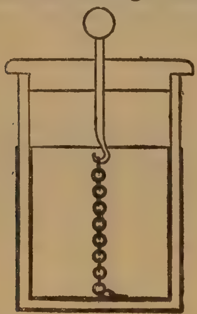
LEATHER: HOW TO RIVET. For harness and similar work two rivets for each joint will generally be found sufficient. Punch the holes out of the leather on a piece of lead, file the rivet to the right length, and cement the leather where the joint is to be. [*See* CEMENT (LEATHER)] Then insert the rivet, if in harness with the head next to the horse, and rivet down lightly, trying to swell out the end only, and not to compress the leather.

LEATHER: WATERPROOF. (1) Boil ½ lb. Venice turpentine in 1 qt. linseed oil. Rub it into the leather while warm till the leather will absorb no more. (2) Warm ¾ oz. paraffin in 1 pt. best lard oil, and rub it well into the leather. The more paraffin there is used, the harder the leather becomes. The less paraffin there is used, the less waterproof the leather becomes. (3) Melt 4 oz. beef tallow, 1 oz. resin and 1 oz. beeswax; and when nearly cooled solid add 6 oz. neatsfoot oil. Warm the leather and apply the mixture with a soft rag. Two applications at least are necessary. (4) For old boots to be used in the snow, apply tar to the soles as hot as the leather will bear without injury, and dry before the fire.

LEVEL: SPIRIT. Plane up a piece of walnut 1 in. sq. × 6 in. long as true as possible. Cut a piece of ½-in. glass tube 4 in. long. Fit a cork in one end, and dip the end in spirit-proof varnish [*see* CEMENT (SPIRIT-PROOF)] two or three times till it is perfectly air-tight. Fill the tube with spirits of wine, and fit another cork in the other end, leaving a bubble about ¾ in. long when the tube is laid on its side. Make this end air-tight as the other end. Let the tube into the walnut till it projects about $\frac{1}{16}$

in. above the side, and fix it in place with plaster of Paris. Cut a piece of sheet brass 1 in. broad × 6 in. long with a slot down the middle ⅜ in. broad × 3 in., and screw it over the tube on to the wood. Make a notch in the brass on both sides of the slot in the middle. The level now only requires adjusting. Level up a flat surface with some well-proved level. Now file and scrape the bottom of the level to be adjusted till the bubble rests opposite the two notches when placed on the prepared surface. Care must be taken to make the level rest all over the bottom, and not on a few points.

LEYDEN JAR. Select any wide-mouthed jar of glass, though unless the glass be very good and dense flint the charge will soon leak away. Cover the lower half of the inside and outside with tin-foil cemented with gold size, and



varnish the top half with shellac varnish. Cut out a lid of wood; bore a hole through it, and insert a brass rod. Attached to the rod is a brass chain, which must rest on the bottom of the jar in contact with the inside layer of tin-foil.

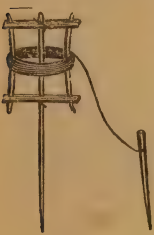
LIGHTNING CONDUCTOR. The rod should be made from a continuous length of copper not less than ¼ sq. in. in section, say a ⅝ in. copper rope, and led straight down from the roof to the "earth". It should be attached to the building with copper staples, and nowhere insulated. The top end should project 3 to 6 ft. beyond the highest chimney, and the strands of the rope opened, so as to form a sharp main point in the centre with a circle of smaller points radiating out all round 3 ft. below. The whole rod should be painted black with the exception of the points which should be plated. The other end must be thoroughly "earthed". To "earth," solder a 3 ft. square copper plate on to the end of the conductor, and let it rest flat on the bottom of a hole dug 6 to 8 ft. deep, or the necessary depth to ensure the bottom of the hole being damp in all weathers. Fill up the hole with foundry coke (not gas coke), tamp well down, and cover with earth. Copper rod or strip is often used instead of copper rope, but the points at the top are harder to make, and it is not so readily bent round angles as the rope. If possible the rod should be all in one piece, but if in pieces the joints should be brazed.

LIME: TEST FOR QUICK-. In most cases the heaviest quicklime is the best. Good lime feels greasy, but poor lime feels gritty and dry to the touch. When good quicklime is slaked, it falls quickly, causes the water to boil furiously, and gives out a quantity of heat; when poor quicklime is slaked, the water hardly boils, and gets only slightly warmed. Good quicklime requires one half its bulk of water to slake it, and when slaked, swells to twice its original bulk; and, if exposed to water, which is continually changed, leaves no residue. Poor quicklime swells to 2½ times its original bulk, when slaked, and always leaves a gritty residue.

LINE: CHALK. To mark off a straight line for sawing off boards,

etc., rub a piece of chalk along a length of whip-cord. Fasten the whip-cord at both ends, lift it an inch or so in the middle, and let it flip down. On removing the cord a dead true chalk line will be found to have been marked.

LINE: GARDEN. Make a frame 10 in. × 12 in. from two narrow strips of board and two round sticks, as shown in the illustration. In the centres of the two pieces of board bore ¾-in. holes. Through these holes put a stick 20 in. long, and place pins through it above and below to keep it in place. The frame should turn easily on the centre stick.



LINEN: HOW TO WASH. (1) To remove stains, mildew, etc., dip the linen in a medium solution of nitric acid, cover with salt, and leave in the sun. This may require many repetitions. (2) Alcohol will remove slight discolorations. (3) Borax is preferable to soda for washing linens and cottons.

MAGIC LANTERN SCREEN. (1) Paint a sheet of duck or calico with a distemper made (*a*) whiting and skimmed milk, or (*b*) thin isinglass, glue and whiting, and lay it on with a broad soft brush whilst hot. (2) Mount good white paper on strained calico, and roll it up like a map.

MAGIC LANTERN SLIDES. *Gelatine:* Pour a thin solution of gelatine containing 2 to 3 per cent. of glycerine on to a level sheet of plate glass, and leave it to dry, away from dust. To ensure the gelatine leaving the glass when set (*a*) rub the glass over with ox-gall before pouring on the gelatine, or (*b*) dust over the glass with French chalk, and rub till no powder adheres; then coat with plain collodion, and allow it to dry before pouring on the gelatine. Lay a thin sheet of gelatine over the illustration to be copied, and trace it off, using a sharp steel point or a needle to scratch into it. Then rub lampblack well into the scratches with the finger, and mount between two sheets of glass.

Ground Glass: Cover a piece of thin "smooth plate" ground glass with glycerine and water; lay it over the design, and trace it through on to the glass with a hard pencil. Then rinse the glass in water, and stand it on its edge to drain and dry. When dry, drop a little Canada balsam on to the middle of it, press another thin sheet of glass on the top, and then heat, which will spread out the Canada balsam, making all transparent, except the pencil marks.

Paper: Cut two pieces of cardboard up into the required size for carriers for each slide, and cut a square, round or oval hole out of the centre. Procure some of the thinnest and best paper that can be written on with Indian ink without running, and which is free from water-marks and blemishes. Make the required drawing or tracing on the paper of the size of the aperture in the cardboard, shading and marking with Indian ink, and hard and soft pencils. Gum the edges of the aperture on one piece of cardboard, lay the picture over it, and stretch it out taut, so that there are no crinkles. Cover the other piece of cardboard with thin glue; lay it on top, and press down till dry. Then give a coating over both sides of the thin paper with Canada balsam dissolved in benzol, which will make the paper transparent.

Photographic: Print the slide from a negative, holding the two prepared surfaces together in front of a lamp for from 20 to 30 secs., and then develop in the ordinary way. To colour, first apply the ordinary negative varnish, and leave to dry. Then paint, being careful to colour in the trees and foreground dark enough; and finally varnish again over all.

Oil Painted: (1) Melt white resin, and when almost solidifying add enough turpentine to keep it liquid when cold; then grind up suitable transparent artists' oil colours with it. If necessary, thin with pale amber varnish. Apply the paint on the glass with one stroke only of the brush, and leave it to dry before applying varnish or more colour on the top of it. (2) Make a varnish of 10 parts bleached shellac, 5 parts Venice turpentine and 15 parts turpentine. Add and grind in the necessary pigments, such as 5 parts indigo for blue.

Water Colour: (1) Boxes of suitable water-colour paints are sold for the purpose. Mix the paints with turps, and add copal varnish to give them body. The colours necessary are crimson lake, Prussian blue, burnt lampblack, burnt umber, burnt sienna, raw sienna, Indian pink and gamboge. To paint the sky or any large surface with a thin coat, first varnish the glass with a mixture of Canada balsam and turpentine, and leave to dry. Then mix the paint with water, rub it on a pallet, and leave it to dry. Make a small pad from a kid glove with the smooth side outside, breathe on the paint, dab it with the pad and immediately dab the glass with it. Repeat this till the place to be coloured is nearly covered all over with dabs, and then dab all over without adding any more paint to spread it out quite evenly. The more it is dabbed the lighter it will become, and it can thus be shaded with one or more colours. For skies, clouds can be afterwards made by damping a small piece of fine linen and wiping them out. Then varnish with the Canada balsam again, and if the tint be not deep enough, repeat the dabbing process. All dark and bright colours must be varnished with Canada balsam to make them transparent. Mix best vegetable black and thin French polish in an air-tight tin, and apply it between the views for a background. To trace a picture, first paint the outline with thick Indian ink; varnish, and then fill in the colouring, finally varnishing again. (2) Coat the glass with negative photographers' varnish, and when set, trace the design with a style and carbon paper. Then paint in the ordinary way. (3) Coat the glass with collodion, leave for ¼ hr., and then coat with 1 part photographers' varnish mixed with 1 part methylated spirits. The slide when dry will appear as ground glass, and may be drawn on with a pencil. Then cover with a mixture of 1 part Canada balsam and 1 part turpentine making all clear again. Mix a little ox-gall with the colours, and apply.

MALLET. For the head use a knot of white oak or ash cut from or near the roots. The knot should be cut at least a year, and be well seasoned, before being made up. Bore a 1¼ in. hole through the middle, and work off two ends at right angles to the hole; then fit in an ash shaft. Work off the two sides square and parallel to the shaft. The two working faces may be made slightly tapering towards the end of the shaft. If possible never let the head get wet, but at any rate never use it except when quite dry.

MALLET: MANURE. Cut the head from a branch of hard wood

4 in. diameter, and make the shaft about 2 ft. long. With the sharp end the manure can be broken up, and with the flat end scattered about.

MANURE: BONE. Place bones in a heap with ashes or sand, and occasionally moisten them with liquid manure or water. In a short time the bones will be the best bone-dust manure.

MANURE: GARDEN. Forest loam and rotting leaves make the best manure for flower-beds.

MANURE: POTTING. For ferns, etc., use the mud that is scraped off the tyre and mud-guard of a bicycle after a muddy ride.

MANURE: STRAW. (1) Use the straw as stable feed and litter in the winter. (2) Scatter the straw behind the plough and cover it up. (3) Spread the straw over the surface of the ground and burn it.

MANUSCRIPTS: TO WASH. Wash the manuscripts in a solution of ferro-cyanide of potassium in distilled water.

MARBLE: ARTIFICIAL. Mix plaster of Paris in a solution of alum; bake it in an oven, and grind to a powder. Mix the powder with water, and mould to shape. This composition will bear a high polish.

MARBLE: HOW TO CLEAN. (1) Slight stains may often be removed with lemon juice. (2) To remove oil stains, make a paste of benzine and dry clay powder, rub one way only, and wash off with soap and water. (3) Powder and mix together 2 parts soda, 1 part pumice stone and 1 part chalk; pass through a very fine sieve, and mix with water to a paste. Rub over the marble with this paste thoroughly, and then wash off with soap and water. (4) Mix 1 oz. ox-gall, 1 gill lye and 1½ tablespoonfuls turpentine, and then add pipe-clay or fuller's earth to form a paste. Apply the paste freely over the stain, and brush off in a few days. (5) Mix a solution of potash or strong soap lye with quicklime to the consistency of cream; cover the marble with this, and leave for 24 hrs. Then brush off, and polish with putty powder and oil on felt. (6) Apply a thick coat of thick gum-arabic or starch, and expose to the sun, or wind, or in front of a fire to dry. The gum will then peel off carrying any surface dirt with it. This method may also be used for plaster of Paris casts. [*See also* STAINS (TO REMOVE INK)]

MARBLE: TO DRILL. Knock out a flat drill as for iron, only rather thinner, making the point at right angles and the cutting edge about 75°; and temper to dark straw. [*See* TEMPERING] Do not use much pressure, and drill if possible dry; if the drill gets too hot, cool it with water or turpentine. It is best to first drill a small hole, and then a larger and larger one till of the required size.

MARBLE: TO REPAIR. If a small piece of marble has to be replaced, it may be moulded from mosaic cement [*see* CEMENT (MOSAIC)], and then polished. If a piece of marble has discoloured spots, chip out the discoloration in the form of a taper hole, and grind in a plug of marble with emery or glass powder. Then clean, and fix with mosaic cement.

MARKER: GARDEN. Fit a hoe handle into the middle of a cross piece 2 in. × 2 in. × 2 ft., after the fashion of a rake. Bore holes in the cross piece close together, and fit in teeth with bluntened ends 6 in. long. Set the teeth so that when the rake is pulled the teeth slant forwards and lift up the earth. The distance

between the seed furrows may be altered by arranging the teeth in different holes at different distances apart.

MAT: TO WASH. *Sheepskin:* Wash the mat in warm water with boiled soap, and when clean, rinse thoroughly in cold water. If the mat be white, a little blue should be added to the water; if it be dyed, add a little ox-gall. Place the mat out in the sun to dry, wool side uppermost, and frequently shake it while drying, or the leather may be cracked. [*See also* FUR (TO CLEAN)]

Toilet: Wash the mats carefully, but do not starch them, or they will stick to damp or warm articles put upon them. If the mats have coloured worsted worked on them, use soda in the first water, and rinse immediately in clean water.

MATCHES: WATERPROOF. Dip the heads of wax-vesta matches in a solution of 2 parts glycerine in 100 parts collodion.

MATTING: HOW TO WASH. (1) Sprinkle dry, unsifted Indian meal over the matting. Dip a mop in hot water, and squeeze it till it does not drip; then rub the matting hard, one length at a time, lengthways with the straw, and use clean water frequently. When the matting is dry, brush the meal off. (2) To brighten the colours, take up the matting and wash it in a solution of 1 pt. salt to a pail of water.

MEASURE: BOX. Make a box 16 in. wide × 16⅘ in. long × 8 in. deep, inside measurements. This box full will contain 1 bushel, and each inch in depth 1 gallon.

MEASURE: REEL. Cut a circle 9 in. diameter from 1¼ in. deal, and saw eight radiating spaces 1½ in. wide × ¾ in. deep into one side to fit spokes into, chipping the wood out with a chisel. Fit in oak spokes, 33 in. long from the centre of the hub to their ends, 1½ in. wide × ¾ in. thick, so that all is flush when they are let into the circle. Make them a tight fit, and then screw them in place. Cut another circle 9 in. diameter from ½-in. deal, and screw it on the top of the spokes, so that all joints are covered. Now make a mark on each spoke 32½ in. from the centre of the hub. Cut the spokes off at this point, or rather leaving them just a shade too long, and taper them as shown in the illustration. Drive a nail into the end of each spoke to save them wearing too quickly, and then file the end of the spoke sharp, leaving the nail slightly exposed. The distance from nail point to nail point should be 24¾ in. One revolution of the wheel should

now give exactly 16½ ft., or 1 pole in length. Measure off 16½ ft. on the level, and then run the wheel over, and see if it exactly corresponds; if it measures slightly too long, file a trifle off each point, and then test again; if necessary, repeat the filing. Drill a ⅝-in. hole through the centre, and fit in a ⅝-in. bolt for an axle. Two pieces of board are placed on each side to receive the axle, and washers of leather are placed between the wheel and the boards. A suitable block is screwed between the boards to keep them the required distance apart, and a cross bar run through it for handles. It is best to paint one spoke a different

colour to the rest, so that each revolution of the wheel may be easily counted.

MEDLEY: WINDOW. Trace a design of a bouquet, or a cross and flowers, on a piece of white or tinted Bristol-board. Among the most effective flowers and their buds are roses, lilies of the valley, sweet peas, fruit blossoms, and ferns and ivy. Lay the Bristol-board flat on a piece of hard wood, and with a sharp thin-bladed knife cut smoothly round the outline as stencils are cut, without detaching any flower or leaf. About $\frac{1}{8}$ of the outline left uncut will be found sufficient to keep the flower in place. A little pricking with a coarse needle as shading will be found effective. Press the points of the leaves and flowers outwards, so that the light will pass through; place it in a wooden frame, and hang it up in front of and close to the window. Lamp shades may be made in a similar way.

MERINO: TO WASH. Grate two or three large potatoes in 1 pt. water; let it stand for $\frac{1}{2}$ hr., and then pour off the clear liquid. Lay the merino on a flat surface, and apply the liquid with a clean sponge, till clean; then dip it in cold, soft water, and hang it up to dry without wringing. Iron while damp on the wrong side.

MICE: HOW TO POISON ORCHARD. Bore 2-in. holes 4 in. deep in blocks of wood. Soak 5 parts corn in water and add 1 part arsenic; leave to soak for 12 hrs. Fill up the bottom inch of the holes, and leave the blocks about the orchard.

MICROSCOPE SLIDES. The glass is usually 3 in. × 1 in. × $\frac{1}{16}$ in., and it should be free from specks and blemishes. The covering-glasses are made in various thicknesses, usually round or square. When very high powers are to be used, the thin sizes are necessary. The glasses should first be thoroughly cleaned by washing them with soap and water, rinsing and drying. Then polish with a button covered with wash leather or an old silk handkerchief.

Cell: A description of cells suitable for "dry mounting" only is given under that heading, the following being the method usually adopted, and may be used either for the "wet" or "dry" method. If a number of cells are to be made, or it be desired to make them very neatly, a turntable should be purchased. The glass must first be thoroughly cleaned, as already explained, and then the centre of the slide found. If a turntable be used this is practically automatic; but if no turntable be available, lay the glass on a piece of paper and go round the edge with an upright pencil. Remove the glass and rule two lines diagonally across from corner to corner, and where they cut is the centre. Now with this point as centre draw a lot of concentric circles or squares of about the size of the covering-glasses. Lay the glass on the paper again with the worst side up, and make a small ink-dot over the centre. When this spot is dry, turn the glass over so that the ink-spot is exactly over the centre; now draw the circumference of a circle in gold size (called cement), using a circle on the paper for a guide, the circle to be of such a size that the covering-glass it is proposed to use will rest on it, but not project over the side. The cement should not be so thin that it runs over the glass, nor so thick that it "strings". When the cement has become almost dry, known as "tacky," apply another circle exactly over the first, and so on till the cement is of the required height. Cells up to $\frac{1}{16}$ in. deep may be built up by this method. If the cement be too thin, leave the cork

out of the bottle, but keep away from dust; if too thick, thin with turpentine. If a turntable be used, it should he rotated fairly fast, and the brush should be so full of cement that it just will not drip. To make deeper cells, paint one layer of cement as before. Then cut a ring from a glass, vulcanite, fibre or brass tube of the required thickness. Vulcanite and fibre will be found easy to work, and to sand-paper up smooth and true. Coat the ring with cement, and when both the cement on the glass and on the ring are tacky, lay it in place. After some little time apply a coat of cement over all to make it air-tight. When the cement is quite hard, insert the object with the necessary liquid, if any, apply a thin coating of cement round the edge of the covering-glass, and press it in place. Place a spring clip on, and put away to dry. The cement should be hard enough, or the spring clip will press the cell out of shape.

Sections: Use a hollow-ground razor fitted rigidly into a handle, and keep one razor for hard and one for softer substances. Lubricate the razor with the liquid in which the object is to be steeped. When a sufficiently good section has been cut, float it off the razor in its steeping liquid by making a little stream run down the blade, or by pressing it off with a camel-hair brush. Keep the razors, when not in use, in (*a*) methylated spirits, or in (*b*) a solution of 4 drops of potassae to ½ pt. water.

Staining Objects: Break up 20 grs. extract of logwood and add 3 teaspoonfuls of water; when as a thick jelly, add 1 oz. boiling water. Dissolve 40 grs. alum in 1½ oz. water, and mix with the logwood solution. Filter, and then add 1 dr. methylated spirits and 3 oz. water. To use, mix 1 part stain with 8 parts water, and keep the object immersed in it till of the required tint.

Dry Mounting: (1) The usual method of making the cells is explained under *Cells*. (2) Cut pieces of mahogany 3 in. × 1 in. × ⅜ in., and sink a hole half-way through for the cell. Cut a piece of wax from a sheet sold for making wax flowers about 1 in. sq.; lay it over the hole, and press it down so that it covers the bottom and sides, and leaves a ridge projecting round the top. Place the object to be mounted in the cell, and attach it to the wax at the bottom with slight pressure; place a covering-glass on the top and press it down. The warmth of the finger will be enough to soften the wax, and make it spread out under the covering-glass. Then remove all superfluous wax round the edge, and gum over the covering paper. If the hole be bored too deep a coloured wafer may be placed on the bottom before the wax is pressed in. The wafer will show through the wax, and take away from the glare. (3) Drill a hole through the centre of a glass slide of the required size with a copper tube, emery and water. [*See* GLASS (HOW TO DRILL)] Mount it on another slide with Canada balsam or gold size, having cleaned and heated it to drive off all moisture. Place the object in the cell thus formed, and cement down another slide or a covering-glass on the top. An object mounted in this way can be viewed from either side, but not with very strong powers, unless very thin glass be used for covering in each side of the centre piece.

Vegetable Substances: Cut a piece from a leaf free from veins, place it in a solution of 1 part nitric acid to 2 parts water, and bring it slowly to a boil. After boiling for a minute, agitate the acid, and then throw it out into cold water. The section can now be divided into its separate tissues with a camel-hair paint

brush. When separated, rinse, stain and mount in glycerine jelly, or Canada balsam, if suitable.

Wet Mounting: Canada balsam is the medium most commonly employed in wet mounting. It is thickened by exposure to the air, but if the bottle be left open for this purpose, it should be covered with paper to prevent dust falling in. Heat makes the balsam thinner temporarily, but it becomes thicker when cold. It may be thinned by adding benzol or chloroform; chloroform is perhaps the best liquefier, but as it evaporates very quickly, the object must be arranged more quickly than if benzol had been used; chloroform also does not keep well. The balsam must be kept free from water or it will turn white and opaque. Before mounting the object it should be freed from all moisture and fat. This may be accomplished in one of the following ways: (*a*) Dry in the air, and then soak in Canada balsam for a few hours. This is only suitable for very strong objects. (*b*) Kill and steep the object in turpentine or oil of cloves till clear, which will take about two hours in turpentine or a few minutes in oil of cloves, and then steep in Canada balsam for a few hours. Dipterous insects of moderate size should be boiled in the turpentine for a few seconds, and then allowed to steep till transparent. (*c*) Kill and immerse in very good and strong methylated spirits for one or two days, and then immerse in the turpentine, and then in Canada balsam as before. This method is usually employed for very damp or watery objects. (*d*) Kill and immerse in very good and strong methylated spirits for a few days, then steep in sulphuric ether to remove fat or oil, then in turpentine or oil of cloves, and then in Canada balsam as before. (*e*) Kill and pickle in liquor potassae, then place away to dry, and then steep in Canada balsam. If the object be opaque, it may often be rendered transparent and nearly colourless by introducing caustic soda or acetic acid into the preparatory steeping liquid. All traces of the soda or acid must however be removed before mounting. Let a drop of balsam fall on to the centre of a clean, dry slide, hold it over a bunsen flame or spirit lamp till the balsam is spread out. Whilst warm and liquid prick all bubbles and remove all dust with a red hot needle. Now lift the object to be mounted out of the balsam bath with a camel-hair paint brush or a flat knife, and place it in the centre of the balsam, care being taken that no air is caught underneath. Replace the slide over the flame, and work the object down with a needle till it rests on the glass; then arrange it suitably with the needle, looking at it under the microscope, and removing all bubbles or foreign matter. Then heat the balsam again over a flame to thicken it, and add more if necessary. Finally, place a drop on the covering-glass, making the centre the highest part, heat it and lay it on the top of the object. Press and work down, pressing out all bubbles; put on a steel clip, and put away for three months to dry. If the object be very thick, it should be mounted with Canada balsam in a cell. If the object be very delicate, benzol or chloroform should be mixed with the Canada balsam to thin it, but time should be given to allow the volatile spirit to evaporate before putting on the covering-glass. After a month or so the edges round the covering-glass will very likely be found to be gaping; the cracks should then be filled up with balsam. Repeat again later on, if necessary. After three months the slides may be

varnished, though it is not at all necessary. To mount whole insect, soak a few of them for from two weeks to a month in liquor potassae. Then place them between two sheets of glass, and express all internal matter gently. Then wash them well with a camel-hair brush and distilled water. Choose the least damaged, float it off on a piece of glass, and put it away to dry. Then immerse in turpentine, then in Canada balsam, and mount with the balsam in the ordinary way. When the object is to be mounted in glycerine, steep the object beforehand in as strong glycerine as can be obtained. Very delicate objects should first be steeped in weak glycerine, then stronger and stronger till the full strength is obtained; if placed direct into the strongest glycerine, they are liable to curl up and crinkle. It is due to this property of glycerine that objects which are curled up, and which would be useless for mounting in Canada balsam, often straighten out in glycerine.

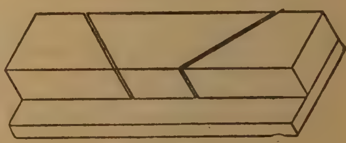
Varnishing: Varnish is applied round the cell, or if mounted with Canada balsam, round the covering-glass. Varnish is only applied to slides for appearance; it is never beneficial, and often disadvantageous. Place the mount away for at least three months, and then paint a ring of Canada balsam diluted with chloroform or benzol round the covering-glass and cell. Leave for another three months and then varnish.

MIRRORS: MAGIC. Lay a piece of paper over the back of a looking-glass, and draw with an ivory or agate point just so hard that it will not break through the silvering. In a strong light the tracing of the point will be reflected, though it is not noticeable on the glass or silvering.

MIRRORS: TO PROTECT. Mirrors should never be hung in the direct rays of the sun, nor where artificial light is used a few inches away, or the silvering at the back will become granulated.

MIRRORS: TO REPAIR. (1) Clean the bare places on the back with boiled or distilled water; dry and polish with blotting-paper. Cut up tin-foil, and mix it to an amalgam with mercury, and spread some on a sheet of tin-foil. Cover the bare patch with thin paper a little larger, and place a prepared sheet of tin-foil amalgam, side down, on the paper with a piece of wood lightly weighted on the top. Jerk out the paper, thus bringing a clean surface of amalgam in contact with the glass. Weight the tin-foil down, and leave for a fortnight. Mirrors may also be silvered all over by this method. (2) Mark out with a knife on a broken piece of mirror a section a little larger than the portion to be repaired. Put a drop of mercury on it, and in a short time the silvery section can be lifted off with a thin bladed knife. Place the section over the portion to be repaired, and press it down all over with a very soft material. Care must be taken that the glass is perfectly clean before putting on the silvery section. [*See also* GLASS (HOW TO SILVER)]

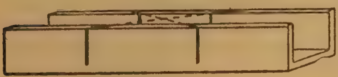
MITRE BLOCK. Cut and plane up square and true from well-seasoned beech one piece 6 in. × 18 in. × 1 in. and another 4 in. ×



18 in. × 2 in. Screw them together as shown in the illustration. Then mark off distances on the top back edge of 3 in. and 15 in., measur-

ing from one end; on the corresponding front edge 7 in. and 11 in. Then join across making two lines 4 in. apart on the front edge and 12 in. apart at the back; draw lines down with a square, and saw kerfs as shown with a tenon saw. A mitre shooting block may be with advantage combined with this block. Cut and plane up square two pieces of beech $1\frac{1}{2}$ in. × $1\frac{1}{2}$ in. × 6 in. Screw these down on the top with one edge of each exactly on the top of the saw kerfs, and then cut the ends off flush with the front and back. The block is used as an ordinary shoot block. [*See* SHOOT BOARD]

MITRE BOX. For the bottom use 1 in. oak or beech 6 in. wide × 18 in. long. For the sides use 1 in. oak or beech 4 in. wide × 18 in. long, and screw them on to the bottom board, so that there is 6 in. air space between them, *i.e.*, screw them on so that the bottom side of each side is flush with the bottom of the box. On the inside edge on the two sides mark off points 6 in.



from each end, four points in all; these points should be 6 in. apart. With a straight-edge draw two lines joining up two pairs of points diagonally, as shown by the dotted lines in the illustration. On the outside of the sides draw down four lines with a square. Place the saw as indicated by the dotted lines, and saw down the lines drawn on the outside of the sides till the bottom board is reached.

MOLES: TO POISON. Soak 5 parts corn in water, in which 1 part arsenic is dissolved, for 12 hrs. Make small holes in the burrows, drop in the corn, and cover over carefully again.

MOSS CONE. Fix an upright stick about 16 in. long to the centre of an old cheese box. Stretch over it a piece of coffee sacking, as in forming a tent, and tack it down to the bottom on the inside, leaving a space of 3 in. all round. Mix equal parts clay and ashes to the consistency of mortar, and plaster over the cone down to the top edge of the box. Cover the soil with moss, and plant small ferns round the base. Keep all well watered.

MOSS: TO PRESERVE. Gather the moss in the summer, place it top downwards in a dark cellar, and leave it there till dry. This prevents the colour of the moss changing.

MOSS TUMBLER. Cover a common tumbler with cotton cloth, and fasten moss to it till it is covered. Glue dried moss to the outside of a saucer; set the tumbler in the saucer, and fill up the saucer and tumbler with earth, and plant violets and small ferns in it.

MOTHS: CLOTHES. If the moth worms have begun to eat the fabric, lay it out flat, wet a coarse towel, lay the towel on the top of the fabric, and go over with an iron. The steam will kill all the worms and eggs. Camphor is only useful to keep the moths away, and if the eggs be once laid camphor is useless.

MOTHS: TO PRESERVE LARGE. Dissolve corrosive sublimate in spirits of wine, making the solution so strong, that when a black feather is dipped in it and dried, a white powder can be seen remaining on the feather. Dilute this solution with spirits of wine till the powder just disappears. Dip the moth's body in, and remove the surplus liquid with blotting-paper. Shake it gently in front of a fire or in the sun till it is dry.

MOUNT MAPS: TO. (1) Cut the backing muslin or canvas, which

should not be too heavy, 2 in. larger each way than the map; wet it, stretch it well out, and tack the edge lightly down on to a flat surface. While it is still damp brush paste well in all over, but not too thickly. Damp the back of the map with a sponge, and when it looks dull, roll it up on a clean wooden roller face inside. Press the edge firmly down on one end of the pasted muslin, and unroll the remainder evenly, smoothing it down as it is unrolled with a soft dry cloth. Press firmly round all the edges, and if there be any air bubbles, prick them with a needle through the backing, and press the spot down. Let all dry slowly; remove the tacks, and cut the muslin off level with the map. Then size, and when dry, varnish; finally bind with red or green ribbon round the edges. (2) To mount a map in sections, mark out and cut the map up from the wrong side into convenient sizes, say 3 in. × 4 in. It will be found best to have an even number of sections. Stretch twilled lining on a frame till all the creases are taken out. Cut a ruler $\frac{1}{16}$ in. square. Dampen and paste the back of a section, and press it down on the backing; then dampen and paste down another section, laying it in the same line as the first, but $\frac{1}{16}$ in. away to the right, using the ruler as a distance piece. Repeat till the first row is laid; then commence on the next row, pasting each section exactly below the corresponding section on the first row and $\frac{1}{16}$ in. away. Complete all as soon as possible; fold up the easiest way, and dry under pressure, such as under a copying or linen press. Then paste a piece of paper on the outside, so that the map is always folded up the same way.

MOUSE HOLES: TO PLUG. (1) Plug up the holes with hard white soap. (2) Mix finely broken glass with portland cement, and cement up the holes.

MUCILAGE: COMMERCIAL. Dissolve 4 parts clear glue in 4 parts water. Add 1 part alcohol and a little alum dissolved in water.

MUCILAGE: GUM. *Arabic:* (1) Put 2 oz. gum-arabic in a ½ pt. bottle nearly full of water, and add 1 dessertspoonful alcohol. Shake the bottle occasionally for a few days. (2) Dissolve 1½ oz. gum-arabic in 3 oz. water, and add 15 drops of a saturated solution of carboline. (3) Mix 1 oz. flour with 1 oz. strong mucilage. This forms a very strong gum when it begins to ferment.

Tragacanth: (1) Dissolve gum-tragacanth in water till of the consistency of starch. (2) Dissolve 2 parts gum-tragacanth, and 1 part gum-arabic in water. A few drops of carbolic acid or oil of cloves prevents moulding.

MUCILAGE MOULDING. Add carbolic acid, alcohol, vinegar, alum or sulphate of quinine to prevent gum moulding.

MUCILAGE: POCKET. Boil and then strain 1 lb. best white glue. Boil 4 oz. isinglass and mix it with the glue. Place this mixture in a water bath with 8 oz. white sugar, and let it evaporate till the liquid is very thick; then pour it into moulds, and leave it to dry. This mucilage immediately dissolves in water.

MUCILAGE: STAMP. Mix 2 parts dextrine in 1 part vinegar, 1 part alcohol and 5 parts water. This is used on the back of stamps, labels, envelopes, etc. [*See also* GLUE (STAMP)]

MUSHROOM CULTURE. Buy a brick of mushroom spawn to start on. Collect 1 part horse manure, 1 part cow manure (the manure must not contain any straw or foreign matter), 1 part

leaf mould, and if possible 1 part sheep manure. Break it up fine, and pass it through a coarse sieve, and add sufficient water to make the whole mass like thick mortar. Spread it out in a layer 5 or 6 in. deep, and press it down firmly. As soon as it dries enough to hold together when handled, cut it up into bricks, and in the centre of each insert a small piece of the spawn from the bought brick, stopping the hole with the manure and mould mixture. Put the bricks on edge with free air circulation. The bricks must be kept perfectly dry, and occasionally turned over till wanted for use. Each brick will shortly be as fruitful as the original brick. To make the bed, take freshly-dropped horse manure free from straw, and mix it with about ½ its bulk of good loam from just beneath grass sods. Keep the mixture under a shed, and turn it over occasionally for two weeks. Make the bed if possible on dry ground, which should be slightly higher than the surrounding ground, or make an artificial hillock of dry faggots. When the manured earth is half dried, spread it 6 in. deep, where the bed is to be, within a frame, and beat it down solid. Make another layer 6 in. deep and beat it down again, and so on till the manure is 3 to 4 ft. deep in winter, and 1 to 2 ft. deep in summer. In a few days the temperature of the bed will rise to 100° Fahr., and will then begin to cool; when at 80° or 90° Fahr. it is ready to receive the spawn. Break the spawn up into pieces the size of a hen's egg, and place the pieces 3 or 4 in. below the surface and 12 in. apart. Leave the bed for at least two weeks, and then scatter 2 in. fine loam evenly over the bed, and pack down firmly, but not hard, with the back of a spade. Place straw loosely over the surface, and if the bed becomes dry, give a slight watering with water heated to 100° Fahr. A temperature of at least 60° Fahr. must always be kept up in the bed. In the winter make the beds in boxes or barrels, and keep them in a cellar. In the middle of summer it will be sufficient to place the spawn in fence corners, etc.

MUSLIN: HOW TO WASH. Melt ½ lb. white soap in 1 gal. water, and empty it into a washing-tub of water. Have two large tubs of clean water, and into one stir 1 qt. bran. Put the muslin into the suds, knead for a few minutes, take out, squeeze (do not wring), and rinse in the bran water for 2 mins.; then rinse in the clean water, and hang out to dry in the open air. [*See also* LACE (TO WASH)]

NAIL: TO DRAW RUSTY. If the nail be rusty, hit the head first to start it; if this be not successful, hold a hot iron on the head till the nail gets thoroughly heated, and then draw.

NAIL: TO DRIVE. In nailing up hard wood, rub a little tallow over the point of the nail before using the hammer. If the nail be big, bore a hole with a brad-awl first.

NAIL RUSTING: TO PREVENT. (1) Mix 1 pt. linseed oil with 2 oz. blacklead. Heat the nails red hot, and drop them into the mixture; then take them out, and let them thoroughly drain. When nearly dry, put them in a nail bag, and shake them up for 5 or 10 mins. (2) Coarse grease may be substituted for the oil and blacklead.

NAILING: SECRET. Take a fine chip down the wood, but leave it attached at one end. Then drive in the nail under the chip, punch it in, and glue the chip down again. When dry, rub over lightly with sand-paper.

NEST: GOOSE. Form a straw nest on 3 in. of horse manure. Place a box over the top with just sufficient cut out of one side for the goose to go in and out.

NOISE: TO LESSEN WORKSHOP. Put 3 or 4 in. sawdust into four kegs, rest a board on the top of the sawdust, and place one leg of the bench into each keg; then fill up the keg with lime, sawdust or sand. Sewing machines, etc., may be mounted in the same way.

NUTS: HOW TO LOOSEN. (1) Place the head of an axe or any heavy weight on one flat of the nut, and hit the opposite flat smartly with a hammer. (2) Keep a strong steady pull on the spanner, and hammer the end. (3) Apply heat to the nut, and then pull with a spanner.

OAK: MINIATURE. Suspend an acorn by a thread of cotton ½ in. over the surface of water. In a few months the acorn will burst and send down a root into the water.

OIL: CARRIAGE. Use best sperm oil or castor oil for the axletree, and heavy animal oil or fat on the fifth wheel. For wood bearing on wood use graphite, or tallow, or graphite and tallow mixed.

OIL: COLZA. To improve the brilliancy of colza oil when used for lighting, add a little camphor or spermaceti.

OIL: CYCLE. *Lamp:* Mix 17 parts sperm oil with 3 parts paraffin oil, and add a small lump of camphor.

Lubricating: Do not use oil for lubricating which may also be used for burning. Use the best sperm oil, or a good brand of oil sold exclusively for lubricating. To clean out the old dirty oil from the bearing *see* CYCLE (HOW TO CLEAN).

OIL: DIRTY. (1) Mix up about 1 part of strong hot soda dissolved in water with 20 parts dirty oil; then decant. A good way to decant is to mix up the two in a tank, which has one pipe entering at the bottom and another at the top. Then run in water by the bottom pipe gently, and the oil will flow out at the top. (2) Filter through flannel stretched over a metal frame, or through charcoal. [*See* FILTER (OIL AND JELLY)]

OIL: DRILLING. Oil or soapy water should be used when drilling steel, wrought iron or any tough metal, but cast iron, brass and all brittle metals should be drilled dry. For drilling glass *see* GLASS (HOW TO DRILL).

OIL: LINSEED. Good raw linseed oil is yellow, transparent, sweet-scented and tastes slightly of cucumbers, Boiled oil should be nearly as limpid as raw oil, and free from "ropiness". A drop placed on a sheet of glass should solidify or form a skin in less than 24 hrs. If 12 drops be placed in a watch-glass and a piece of potassium the size of a pin's head added, the oil should remain unchanged. It should smell slightly of freshly-crushed linseed meal, and should taste mellow, not acid or bitter. To boil, fill an iron kettle half full of raw linseed oil, and add 1 oz. litharge for every gallon of oil. Heat it until it settles all the foam that appears on it, and until a light blue smoke appears. Another way to test when it is sufficiently boiled is to dip a feather in, and immediately the feather begins to scorch, remove the oil from the fire. If it be desired to make the oil dry very quickly, add more litharge, and continue to boil about 15 mins. after the blue smoke appears.

OIL: MACHINE. For heavy machine work use best sperm oil.

For sewing machines, etc., mix 1 part olive oil with 1 part paraffin oil.

OIL, NEATSFOOT: TO REFINE. (1) Filter neatsfoot oil through a cone made of zinc, with a few holes at the bottom, and filled up with animal charcoal. (2) Mix 1 qt. oil, ½ lb. bright lead shavings, ½ lb. pounded lime, and place in a glass jar. Expose the jar to the sun for two or three weeks, and then empty out the oil and lime into a saucepan with ½ lb. washing soda. Boil this gently for ½ hr., and then set it away in as cold a place as possible for 12 hrs. The oil will then become congealed, and it must then be filtered through filter paper, being kept cold all the time, or the soda will filter through with the oil. Oil thus refined may be used for all light machinery, clocks and watches.

OIL, NON-MINERAL: TO TEST. Smear tin with the oil, and hold it to the light varying the angle. If it be adulterated with mineral oil, prismatic colours will be seen.

OIL: OLIVE. Pure olive oil pales slightly when heated to a high temperature; adulterated oil does not, and gives off an offensive odour. To refine olive oil, place lead chips into it, when in a short time a white precipitate will be formed, leaving the oil clear. Decant this clear liquid, and keep it in a stoppered bottle.

OIL: PETROLEUM. To test, heat watet to 110° Fahr., and stir in a little paraffin. The oil will float on the top, and if it catches fire when a light is applied to it, it should on no account be used. To remove the smell of petroleum from a vessel in which some has been kept, pour milk of lime into it, and shake it round; allow it to stand for a few minutes, shake again, and then empty. The outside is treated in the same way. Particles of thick petroleum, which adhere to the sides, can be removed by stirring in shot or sand. After the vessel is emptied, rinse in clean water, and then fill up with water to which ½ saltspoonful chloride of lime has been added. Allow it to stand for an hour, and then rinse out with clean water. If the liquids be hot, the operations will be facilitated.

OIL: SAW. Use animal oil, mutton fat, lard or pork rind. Do not use mineral or vegetable oils.

OIL: TURPENTINE. Good turpentine oil should be colourless, and as clear as water. It should have a strong, penetrating smell, and be highly inflammable. If a drop be put on a sheet of writing-paper and held in front of a fire, it should dry without leaving a mark.

OIL: WAGGON. Dissolve ½ oz. soda and ½ oz. potash in 6 oz. water. Melt 5 oz. tallow, and mix it with 4 oz. sperm oil; then pour in the potash and soda water and stir; then stir in 8 oz. graphite till the whole mass is homogeneous. [*See also* OIL (CARRIAGE)]

OIL: WATCH. Use glycerine, purified olive oil or purified neatsfoot oil. [*See* OIL (NEATSFOOT: TO REFINE), and OIL (OLIVE)]

OIL-CLOTH: TO WASH. Wash with a soft flannel and lukewarm water. When nearly dry wet with a sponge dipped in milk and polish with a dry flannel. If very dirty, clean with a warm solution of magnesia, and follow with warm water, as above. Never use soap, a hard brush, or very hot water.

OIL-STONE. When the stone has been worn hollow or groovy, rub it longways on a flat hearthstone or window-sill, or on glass-paper mounted on a level board, till flat. For chisels, etc., use sweet or

olive oil, and if the stone be very hard, and will not "bite," apply a pinch of flour emery with the oil. For razors and fine cutting tools, use a mixture of glycerine and alcohol. The proportions vary from 3 parts glycerine and 1 part alcohol to almost pure glycerine. Some stones work better with pure water than oil. When selecting a stone, draw it lightly over the teeth, or the nails. If the stone clings, and does not feel gritty, it is good. Keep the stone covered when not in use.

ONION KETTLES: TO DEODORISE. Dissolve a teaspoonful of pearlash or saleratus water in the washing water.

OVEN: OUTDOOR BRICK. After preparing the foundation, lay two courses of brick for the bottom, then build the mouth and part of the sides until it is desirable to begin to draw the sides inwards. Fill up the oven with sand or friable earth, and then smooth off the top into the desired shape for the inside of the oven. Build two courses of brickwork over this shape with the best mortar. When the mortar has set, remove the sand. The bricks should be soaked in water for 2 hrs. before using them.

PAIL: HOW TO CLEAN MILK. Wash the pail as an ordinary utensil, and then dip the pail into a saturated solution of lime water, made by mixing quicklime in water, and leaving the lime to settle. Dip and give a turn as quickly as possible, so that all parts of the pail are reached, and then set the pail to drain. In some cases this is preferable to the usual scalding method. Give the pail three coats of copal varnish about once a year.

PAIL-RACK. Nail cleats $1\frac{1}{2}$ in. × $\frac{3}{4}$ in. 8 in. apart on to an upright post, which should be about 6 in. square, as shown in the illustration. This economises room, and allows

a free circulation of air round the pails.

PAINT. Wood should be first prepared by being planed, and then all knots stopped or killed. [*See* KNOTTING] Dip the end of the brush only in the paint; begin at the highest point, and work downwards. After the surface is coated, sweep the brush from end to end, allowing the brush to leave the surface gradually, and never stop abruptly. Apply thin coats only, and when the brush is first loaded, work at those parts needing most protection. If the surface be rough, it will require more pressure, and more working with the brush. Before applying the finishing coats, rub down smooth with pumice stone and water. The finishing coat in a room is preferably made "dead," *i.e.*, the pigment is mixed with turps and only enough oil or varnish added to bind it. All joints in woodwork for outdoor use should be covered with white lead before they are put together, and driven together while the paint is wet. The paint besides preserv-

ing the wood acts as a cement. To test the paint, apply a little to the thumb nail, and if it be full of specks, the paint is not sufficiently ground. Good paint has a clear, bright look, and is very adhesive; bad paint is dull and watery.

Board: Make a board from ½-in. deal, and plane one edge, which should be about 2 ft. long, bevel. This board should be held in the left hand to protect parts not to be painted, or to keep paper clean when whitewashing a ceiling.

Driers: The less drier used the better, but the longer the paint will take to dry; at most 1 oz. drier should be added for every 1 lb. raw linseed oil. More drier will be required in cold than in hot weather. For ordinary work the following are the usual driers, their excellence in order: (*a*) Japan gold size made by boiling linseed oil, red lead, litharge, copperas and gum-anine together. (*b*) Pour 3 or 4 gals. raw linseed oil into a shallow receptacle, and add 4 oz. litharge for each gal. raw oil. Stir every day for a fortnight. (*c*) Sugar of lead. (*d*) Patent driers. (*e*) Borate of manganese. (*f*) White vitriol. (*g*) Borate of lime. (*h*) Borate of zinc. (*i*) Sulphate of zinc. (*f*) (*g*) (*h*) and (*i*) are seldom used.

Grinding: Tie a cotton cloth over the top of a small wooden or tin bowl, and leave it slightly sagging in the centre. Pour paint powder on to the cotton, and rub it through into the bowl with a piece of wood about 2 in. in diameter rounded at the end. If the paint is mixed, mix it well before passing it through the sieve.

Injuring: Manure, ammonia, lime, washing soda and potash are very injurious on paint, and should be removed with water immediately.

Keeping: If there be any paint left over in a pot, let a slight skin form, and then cover it over with ½ in. raw linseed oil. When wanted for use, pour off the oil, remove the skin, and stir the paint.

Oil: For all outdoor work raw linseed oil, turpentine and a little drier only should be used. For indoor work boiled linseed oil may be used, though raw oil is always better, but takes longer to dry. For preparing boiled oil, testing oils, etc., see OIL (LINSEED).

Priming: The first coat for outdoor work should be the best white lead. For indoor work, or where rain is not to be feared, mix red lead and white lead with thin linseed oil. For woodwork, first stop all holes and cracks with white-lead putty stained to the required tint. For the priming coat mix 2½ lb. white lead, 1 oz. red lead and 1 oz. litharge in 1 pt. linseed oil. For the second coat mix 2 lb. white lead, 4½ oz. litharge, 6½ oz. linseed oil and 1½ oz turpentine. For the third and subsequent coats mix 2 lb. white lead, 4 oz. litharge, 4 oz. linseed oil and 3 oz. turpentine. These quantities will be sufficient for 150 sq. ft.

Removing: (1) Small spirit jet lamps are sold for the purpose of removing paint by heat. The flame is run over the surface, and as the paint blisters it is removed with a blunt chisel. After the paint is removed, rub down with pumice stone. (2) Mix equal parts soap, potash and slaked lime with water to a paste. Apply this over the paint with a brush, and leave for 3 or 4 hours, then remove with a blunt chisel. (3) Boil 3 lb. washing soda and 2 or 3 oz. potash in 1 gal. water, and apply it over the paint with a brush while hot. In a few minutes the paint may be scoured off with a stiff brush. This method is usually employed for removing paint from stone. It is in most cases preferable to remove paint from wood by heat, but where acids or caustic soda have to be

used, wash down immediately afterwards with warm water, or the surface of the wood will be damaged.

Removing the smell of: Mix 1 oz. vitriolic acid in water, and stand it in tubs in the rooms which are being painted. The tubs should be frequently replenished.

Shading: White is shaded by adding black; yellow, by umber or ochre; vermilion, by lake; blue, by indigo; rose, by black; etc.

Time: A fine autumn or spring day is the best time for outdoor work.

PAINT: BLACK. To paint cloth, mix 2 parts boiling soap suds, 1 part yellow ochre and 1 part lampblack. Lay it on as thick as the brush will spread. In three days finish with black paint. [*See also* PAINT (LAMPBLACK: PURIFYING).]

PAINT: BLACKBOARD. (1) Dissolve 4 oz. shellac in 1 qt. alcohol (95 per cent.), and then add 6 drs. lampblack, 10 drs. ultramarine and 2 oz. powdered rotten stone. Before use, shake the bottle up and pour some out in a saucer; apply as quickly as possible with a soft brush. (2) Measure out 1 gal. methylated spirits, and mix with a portion of it to a thick paste 10 oz. pulverised pumice stone, 6 oz. pulverised rotten stone and 12 oz. lampblack. Dissolve 14 oz. shellac in the remainder of the spirits, and then grind up the paste in it. (3) Dissolve 4 oz. glue in ½ qt. water, and then add 3 oz. flour emery and enough lampblack to give a deep inky colour. Stir till no lumps are left, and apply two or three coats with a woollen rag rolled smooth. If the final coat of paint appear too glossy, it should be rubbed over lightly with a piece of pumice stone and water. Then apply another coat with less shellac, and more lampblack mixed in it. If a wall is to be painted, remove the whitewash with sand-paper, and fill up all holes, and make level with plaster of Paris.

PAINT: BLUE. Mix Prussian blue with the oil. To make darker, add a little lampblack; to make lighter, add white lead.

PAINT BRICKWORK: TO. Before painting with the oil paint, apply one of the following grounds to stop damp working through, which would make the paint peel off: (1) Mix ¾ lb. mottled soap in 1 gal. water, and lay it on evenly, taking care that it does not lather. After 24 hrs. apply a coat of ½ lb. alum dissolved in 4 gals. water. When dry apply the paint. (2) Melt and mix together 1½ lb. resin, 1 lb. Russian tallow and 1 qt. linseed oil; apply it hot, and when dry, paint. (3) Rub down both sides of the wall freely with cement water, and plug all holes and cracks with paint skins. Bricks require 3 or 4 coats of paint; cement, 5 or 6 coats. 1 lb. paint should cover from 4½ to 6 sq. yds. of wall per coat. 1 lb. pitch dissolved in 1 gal. tar will cover 15 sq. yds. of wall per coat.

PAINT: BRONZE. Mix yellow and black.

PAINT: BROWN. (1) Mix carmine, yellow and black. (2) Mix burnt umber and crimson lake. This makes a reddish brown. (3) Mix burnt sienna and lake; or white, red and a little black. This makes a light brown.

PAINT: BUFF. Mix yellow ochre with white.

PAINT BURIED WOOD: TO. Mix charcoal with raw linseed oil till of the required consistency, and apply as ordinary paint. [*See also* TAR PAINT and GATE-POSTS]

PAINT CARRIAGES: TO. If possible do not use paint containing gum-shellac. Use a little japan for the drier. Give plenty of time for the first coat to dry before applying the next. Do not fill any hole with putty before the first coat is dry. Three coats of paint at least are usually given.

PAINT: CHESTNUT. Mix crimson lake, yellow and a little black.

PAINT: DRAB. (1) Mix lampblack and white. (2) Mix burnt umber and metallic brown coloured paints.

PAINT: ENAMEL. (1) Mix 2 oz. burnt umber, 2 oz. blacklead and 4 oz. litharge in 1 lb. raw linseed oil. Paints mixed with this oil have a varnished appearance. (2) Mix zinc white with dammar varnish and turpentine. Apply two coats of white-lead paint, one coat of zinc paint, and then one coat of the paint varnish. (3) Grind up the required pigments with pale copal varnish, and add also if desired a very little linseed oil; then thin with turpentine till of the required consistency. All enamels should be applied on a "flat" ground, which should be of the same tint, but slightly lighter in shade than the enamel. [*See also* VARNISH (JAPAN) and VARNISH (LACQUER)]

PAINT: FLEXIBLE. (1) Dissolve 2½ lb. soft soap in 1½ gals. boiling water, and grind the solution with 125 lb. good oil paint. (2) Mix lampblack with double boiled linseed oil. This is used for painting canvas canoes, etc.

PAINT FLOORS: TO. Give one coat of the desired colour; 1½ lb. yellow ochre mixed with 1 qt. raw oil and a little drier will be found very durable. After the first coat is dry, stop all cracks with litharge mixed with putty. Apply the second coat, and when it is dry, rub over it with glass-paper. Add more japan to the paint for the last coat.

PAINT: GOLD. Mix gold dust [*see* GOLD POWDER] with thin varnish or gum water.

PAINT: GRAY. (1) Mix all the paint skins and pot scrapings with oil; heat up and strain through a cloth. (2) Mix white and black; a little blue may be added to make an ash or lead colour. (3) Mix white, crimson lake and Prussian blue. This makes a flaxen pearl gray.

PAINT: GREEN. (1) Paris green. (2) Mix yellow and blue. (3) Mix violet and green in equal parts. This gives an olive green (4) Burn verdigris or any copper green to make it olive colour. [*See also* PAINT (BRONZE)]

PAINT: INDIGO. This being a very dark blue, white lead should as a rule be added.

PAINT IRON: TO. The best paints for iron are those made from iron oxides. Where iron comes in contact with wood, use red lead and raw oil. Iron oxide paints are, however, expensive for painting fences, etc., and for such work the following will be found useful: (1) Dissolve asphaltum in turpentine till it is of the required consistency. (2) Melt 8 lb. asphaltum, and then add 5 gals. boiled linseed oil, 1 lb. litharge and ½ lb. sulphate of zinc. Boil slowly for 3 hrs., and then add 1½ lb. dark umber and boil for 3 hrs., or until the mass becomes quite thick when cool. Thin to the required consistency with turpentine. [*See also* TAR PAINT and IRON (HOW TO BLACKEN)]

PAINT: LAKE, TEST FOR. The best madder lakes are soluble in ammonia, but poor madder lakes are not. Crimson lake and carmine lakes should be in a very fine powder, and when dry, of a purplish tint.

PAINT, LAMPBLACK: TO PURIFY. Place the lampblack powder about 2 in. deep in a shallow iron tray over a clean, hot fire. Stir the powder till all the dirty smoke has been given off, and till it becomes red hot.

PAINT: LILAC. Mix ultramarine, white and a little carmine.

PAINT: MAHOGANY-COLOURED. Mix lampblack

with Venetian red; and when dry, varnish.

PAINT PLASTER: TO. If the walls have been previously whitewashed, they must be scraped with a flat edge of steel, such as the back of a saw-blade, then rubbed down with sand-paper, then with pumice stone and thoroughly brushed. Fill up any cracks there may be with plaster of Paris mixed with vinegar and water. For the first coat, mix 4 lb. white lead to 1 pt. linseed oil; second and subsequent coats, 5 lb. white lead to 1 pt. linseed oil. For outdoor plaster, use red lead instead of white lead for the first or priming coat.

PAINT: PURPLE. (1) Mix madder red and ultramarine. (2) Mix vermilion and ultramarine. (3) Burn carmine madder till of the required shade. (4) Mix dark red and violet. The paint sold as "purple lake" nearly always fades very soon.

PAINT, RED LEAD: TEST FOR. Pure red lead paint powder, when slightly compressed with the finger, should show no crystals.

PAINT: ROSE. Mix carmine, vermilion and white lead or zinc.

PAINT: SALMON. Mix burnt sienna, white and a little orange chrome.

PAINT: SCARLET. Mix carmine with a very little yellow.

PAINT: STONE-COLOUR. (1) Grind 25 parts white lead, 2 parts burnt umber and 1 part ultramarine in raw oil. This gives a bluish tint. (2) Mix umber, sienna, or yellow and white. This gives a tint as Portland cement.

PAINT, ULTRAMARINE: TEST FOR. (1) Place a little on the thumb nail, and rub it with the ball of the finger. If it be full of hard specks, and feel gritty, the paint is poor. (2) Place a little in a shovel over a clear fire, and heat red hot. When cooled, the paint should be as it was before heating. (3) Pure ultramarine looses its colour when mixed with lemon juice.

PAINT: VERMILION. Vermilion after a short time usually turns brownish. To prevent this, add 1 part flowers of sulphur to 8 parts vermilion before mixing. To test vermilion, mix it with muriatic acid. If the paint remain unchanged the paint is good, if it turn grey the paint is poor. Orange coloured vermilion is the best.

PAINT: WHITE-LEAD. Mix best white lead with raw linseed oil, turps and a little drier for the first coat for woodwork, etc. It should also be applied to the joints in wood for outdoor use before they are put together. A cheap white paint for fences and barns is made by mixing 3 lb. crude petroleum, 1 lb. linseed oil and 1 lb. white lead. To test if the paint be pure: (1) Place some white lead on a shovel, and heat it over a clear fire. If it remain unchanged, it is most probably pure; if adulterated, it will turn gray or crumble. (2) Dissolve white lead in dilute nitric acid; evaporate nearly to dryness; dilute with distilled water, and filter. If any residue be left, the paint has been adulterated.

PAINT ZINC: TO. (1) Dissolve 1 part chloride of copper, 1 part nitrate of copper and 1 part sal-ammoniac in 64 parts water; then add 1 part commercial hydrochloric acid. Brush the sheets of zinc over with the mixture, and in about 24 hrs. the coat will have become dry, leaving a black rough surface on the zinc to which the paint will adhere. (2) Any desired colour can be obtained by mixing the pigment with acetate of lead; as for instance, blacklead mixed with the salt gives a light brown tint.

PAINTED SURFACES: TO WASH. Rub the surface over with a damp flannel and best

Spanish whiting, and rinse with clean water.

PAINTINGS: TO RENOVATE OIL. The amateur should not attempt to restore valuable pictures, but should send them to a professional. If the pictures be not very valuable, mix ox-gall with water, dip a small clean sponge in, wring it fairly dry, and pass it over the picture again and again, continually changing the surface of the sponge, and keeping it damp with clean liquid. When the surface dirt seems removed, wrap the sponge in clean linen, and then rub it over as before. If the linen remain clean, all the surface dirt has been washed off. This will often be sufficient. Water should never be run over a picture, hot water and soap being especially ruinous. The varnish may be dissolved by spirits of wine, ammonia water, liquor potassae, naphtha, oil of lavender, soda, etc. It is therefore obvious that a good deal of experience must be acquired before one can decide which is the proper solvent to use, as the application of a wrong solvent is often harmful. As a rule it will be safe to dampen a pad of linen with turpentine, and rub gently, always presenting a clean surface of the pad, or the dirt may be rubbed in. If the picture be then cleaned sufficiently it should be revarnished with special varnish sold for the purpose. If the picture be still dirty, it is generally safe to dilute 12 parts spirits of wine (58°) with 3 parts water or turpentine, or by the addition of 2 parts unboiled linseed oil, and to soften remove the varnish by wiping the liquid over with a linen pad; leave it for a minute, and then remove the soft varnish with a damp sponge. Unvarnished pictures are best cleaned by wiping them over with damp chamois or buff leather. The colours of a picture from which the varnish has been removed may often be brightened by placing the picture in an air-tight box, in the bottom of which there is flannel dampened with strong alcohol.

PAPER: CARBON. Mix well-pulverised carbon and sweet oil to a paste, and rub it over paper with a flannel. To trace a pattern on a piece of paper, lay the paper down, place the black side of the carbon paper next to it, and on the top or clean side of the carbon paper place the pattern to be traced. Go over the pattern with a steel or ivory knitting needle, remove the pattern and carbon paper, and the pattern will be marked on the bottom sheet of paper.

PAPER CREASES: TO REMOVE. Slightly moisten the back of the paper, place a cloth over it, and iron with a hot iron. If there be a bundle of papers, sprinkle the papers with water at regular intervals, and then place the bundle under pressure.

PAPER: FIREPROOF. Dis solve 8 oz. alum and $3\frac{3}{4}$ oz. white soap in 4 pts. water. In another vessel dissolve 2 oz. gum-arabic and 4 oz. glue in 4 pts. water, and then mix and heat the two solutions. Immerse the paper in the solution, and hang it up to dry.

PAPER: GREASY. Expel as much oil as possible by heat, and then apply some turpentine to the hot paper; complete by rubbing over a little alcohol. To write on greasy paper, add a little ox-gall and salt to the ink.

PAPER: METALLIC. (1) Soak the paper in a saturated solution of alum, and then pass it through a saturated solution of carbonate of soda. (2) Add carbonate of soda gradually to a saturated solution of alum until all effervescing ceases; then apply it with a soft brush to the paper.

PAPER: PARCHMENT. Mix 1 part nitric acid in 3 parts water, and immerse unglazed paper in it.

Immediately the paper hardens, wash it in clean running water, and then place it in water with a little ammonia in it. Take it out, and stretch it on a board to dry.

PAPER: HOW TO REPAIR. (1) Macerate paper and gum water thoroughly with a knife till it is as thin butter. This paste should be applied with a very fine miniature paint brush along the edge of a tear, and the other edge pressed down on to it. Worm holes, etc., may be filled also with this paste. To make large quantities of this paste, place paper clippings in water, and leave them for about a week, changing the water every other day. When quite soft, pound them up in a mortar, and then boil in water. Allow the pulp to cool, squeeze out all superfluous water, and then pound it up with flour paste or gum water. (2) Another way to mend tears is to paint the torn edges with size, and then run the joints between rollers under pressure.

PAPER: TRACING. (1) Dissolve 2 oz. Canada balsam in 3 oz. turpentine with a trace of nut oil in it; sponge the paper down with this liquid, and hang it up to drain and dry. Then roll between rollers covered with paper under pressure. (2) For temporary purposes damp the paper in benzine.

PAPER: TRANSPARENT. Mix 6 parts turpentine with 2 parts gum-mastic, and immerse unsized paper in it. [*See also* PAPER (TRACING)]

PAPER: WATERPROOF. (1) Dissolve 19 oz. white soap in 1 qt. water. In another vessel dissolve 1¼ oz. gum-arabic and 5½ oz. glue in 1 qt. water. Mix and then warm the two liquids. Soak the paper in the hot liquid, and hang it up to dry. (2) Dissolve pure Para rubber cut up into fine shred in bisulphide of carbon and 6 per cent. alcohol. Apply the mixture with a scent atomiser, or as a varnish, two or three times, drying each coat at a gentle heat, not exceeding 150° Fahr., before applying the next. This also makes the paper proof against acids and alkalies. [*See also* DRAWINGS (HOW TO FIX CRAYON)] (3) For stiff cardboard, mix 4 parts slaked lime and a little alum in 3 parts skimmed milk. Give two coatings of the liquid with a paint brush.

PAPER-HANGING. Old highly-coloured paper should be removed before repapering by wetting the paper with hot water, and scraping it off with a steel scraper. If the wall be white-washed, wash it with a mixture of vinegar or salt and water. Apply paste both to the wall and to the paper. Trim one edge of the paper, and cut a dozen or so strips slightly longer than the distance from the cornice to the bottom board or dado, so that the pattern may be made to match. Lay them face down on a table, which should be larger than the strips. Paste the back side of the wall-paper [*see* PASTE (PAPER-HANGER'S)], beginning at the lower end, to prevent the paper becoming tender at the top by the moisture soaking through. After pasting, take hold of the two lower corners and double the strip. Then double the upper half back again, letting the lower end project a few inches below where the first fold was made; now take hold of the two upper corners, and carry the strip to the wall. Commence papering in a corner, and go round to the right or left, depending on which edge of the paper is trimmed, and also work away from the source of light, so that the joint does not throw a shadow. After pasting the upper edge to the wall, step down, pull out the folds, and roll the paper down on to the wall. If the paper be good, roll it down-

wards with a roller, and then rub all over with a soft cloth; if cheap paper be used, brush down with a broom, for a cloth would smudge the colours. Hang the next strip in the same way, matching and overlapping the first strip. Each strip of paper should project over the cornice and the board at the bottom. Run the finger or the back of the scissors over the paper along these angles, and cut off the paper to the mark formed with long shears; then stick smoothly in place. Cut to fit over the door, fireplace and windows in the same way. After a few strips have been hung, use a plumb to see if they hang perpendicularly; if they do not, lap the strips at the top or bottom to bring it plumb after a few more strips have been hung. If the hands perspire freely, rub a little plaster of Paris over them.

PAPIER-MACHE. (1) Cover a sheet of good hard writing-paper with best flour paste, to which has been added a little glue, alum and oil of cloves. Lay another sheet of paper on the top, and roll with a rolling-pin; then paste, and lay on a third sheet, and roll again, and so on till the paper has become of the required thickness. Now lay it in a mould of carved wood, plaster of Paris not giving such a sharp impression, and roll it till the paper has filled up the mould entirely; then leave till the paste begins to dry, when it should be rolled again, and then left to dry for about a week under pressure. The papier-maché may be dried under pressure by clamping it and the mould in a tennis racquet press, or better, under a letter or linen press. When dry stain it to the required shade, then rub over with oil, applying it very sparingly on the tip of the finger, and finally varnish with Sœhneé No 3, or some similar elastic varnish. Paper treated in this way may be made up into panels for cupboards, books, etc., and if dried under pressure will be as hard, if not harder, than wood. If parchment paper be used, the resulting papier-maché will then have the properties of horn. (2) Make a paper pulp with paper and gum [*see* PAPER (REPAIRING)], and mix it with white lead, glue and any required pigment. Work this up in the hands till as a thick dough. Then oil the mould, and put a thin layer of the dough in, pressing it well into every corner and crevice. If the mould be made of plaster of Paris, give it two or three coatings of shellac varnish before oiling. Paste two or three layers of paper or muslin on the back of the paper pulp, leaving about 1 in. projecting round the edge, to prevent the cast buckling when it dries, and leave for about a week to dry. This is properly speaking Papier-pourri, Papier-maché being sheets of paper pasted together as in No. 1. (3) Mix 1 oz. tissue paper, 5 oz. thick flour paste and 1 oz. pipe-clay. Grind it up in a mortar, adding a little at a time with the required pigment. Then cast into a mould, as explained in No. 2.

PARALLEL BARS. These are made of four upright posts 3 in. × 4½ in. fixed in the ground or mounted on a frame. The two bars should be of 2 in. round ash, and at least 6 ft. long. They should be supported about 20 in. apart, and about the height of the hips.

PASTE: BOOKBINDER'S. (1) Steep 4 oz. starch for 15 min. in water, and stir it till it becomes milky. Add a pinch of alum, and boil. Then add a little oil of cloves or carbolic acid to keep the paste from turning mouldy. (2) Make 1 teaspoonful best white starch to the consistency of cream, and pour boiling water over it till it appears as a jelly. Then leave to cool, and when set, squeeze it

through muslin. [*See also* GLUE (BOOKBINDER'S)]

PASTE: CLOTH. Mix together 1 lb. best wheat, 1 tablespoonful powdered resin, and 1 tablespoonful powdered alum with water to a paste. Place it over the fire, and stir till all lumps are removed, and until the stirring spoon will remain upright in the mixture. Apply a thin layer to the surface, and then press the cloth on with rollers. Leather should be wetted before being pressed on to the pasted surface. The edges are trimmed after the paste has dried.

PASTE: GLUE. Mix flour, white of egg and yeast together; work up to a dough with gum water, and dry in an oven. When nearly dry, cut it up into cakes for use. To colour red, add vermilion or carmine; blue, add indigo; yellow, add saffron; etc.

PASTE: LEATHER TO PAPER. Soak 4 oz. glue in 1 lb. water for several hours; warm till the mixture is clear, and then dilute with 4 lb. boiling water. In another vessel mix two or three times as much thin starch paste. Mix the two together, and stir whilst both are boiling. [*See also* PASTE (CLOTH)]

PASTE: OFFICE. Mix 1 qt. wheat flour in 2 gals. cold water; rub out all the lumps, and then add 4 oz. finely-pulverised alum. Boil for about 10 mins. till of a thick consistency; then add 1 qt. hot water, and boil again until the paste becomes pale brown and thick. The paste should be stirred whilst being boiled. This paste is strong, and will keep for about 2 weeks.

PASTE: PAPER-HANGER'S. (1) Mix 200 parts flour paste with 20 parts liquid glue [*see* GLUE (LIQUID)], 1 part white of egg, and a little carbolic acid or oil of cloves to prevent the paste turning musty. (2) Make a batter of 1 pt. wheat flour, and thin out by gradually adding 1 gal. hot water. Keep it over a fire, and stir till the milky appearance turns a cream colour; then leave to cool, and add a little carbolic acid or oil of cloves. (3) Mix 1 oz. alum dissolved in hot water to every 3 qts. flour paste. Wash the walls with glue water, and apply this paste to the paper.

PASTE: PAPER TO METAL, GLASS, ETC. (1) Add a little honey, acid, glycerine, sugar, treacle, or a solution of chloride of antimony to ordinary paste or glue. The metal or glass must be freed from grease before applying the paste. (2) Mix 1 part albumen of eggs with 1 part water, and apply. When dry, pass a hot iron over to make the paste waterproof. The metal should be freed from all grease before applying the paste. [*See also* PASTE (WATERPROOF)]

PASTE: PERPETUAL. Dissolve 1 oz. alum in 1 qt. water, and when cold add flour till of the consistency of cream. Stir in 1 teaspoonful powdered resin, 2 or 3 cloves, and boil to a mush, stirring all the time. This paste should be kept well corked up.

PASTE: RICE-FLOUR. Boil rice, and work it in water till it is formed into a paste. If cloves are boiled with it, the paste will keep a long time, and is specially suitable for clean fancy work, etc. When made of the consistency of plaster, it may be formed into models, which can be highly polished when dry.

PASTE: STRONG. Mix flour in cold water till as a plaster, and then pour boiling water over till as a paint. Then add 1 or 2 tablespoonfuls brown sugar, a little corrosive sublimate, and 5 or 6 drops oil of lavender.

PASTE: WATERPROOF. Mix 1 lb. flour paste, 1 lb. glue, 1 oz. linseed oil, 1 oz. turpentine and 1 oz. varnish. This paste is useful

for affixing labels to jars in damp places. The paste should be applied to the paper while lukewarm, left to dry, and then moistened and pressed on to the jar.

PATH: ASPHALT. Mark out the path, and then excavate about 4 in. Lay 2 in. × 4 in. scantlings along the sides of the excavation, and stake them firmly down. The stakes should be sawn off level with the scantling. Spread the concrete [*see* CONCRETE (TAR)] so that the surface will be about 1 in. above the scantling The path must be made to camber about 1 in. higher in the middle than at the sides for every 3 ft. of breadth for the rain water to drain off into the gutter at each side.

PATH: CURVED. For lawns and ornamental grounds, lay out the paths with a clothes-line. Lay the line till the desired curve is obtained, and then stick small stakes all along. Cut a stick the desired width of the walk, and using this as a gauge set the second row of stakes equidistant from the first row. The stakes should be left in position until the walk is finished.

PATH: GRAVEL. The ground should be excavated till a good foundation is found. Fill up to within 2 in. of the surface with cinders, or bricks, or stones, or coarse gravel, and cover with 2 in. clean fine gravel. Frequent rolling prevents the growth of weeds. If the ground retains water a tile drain [*see* DRAINAGE (LAND: *Tile*)] should be laid about 18 in. below the surface.

PATH: SAWDUST. Equal parts sand and sawdust, confined between wood or bricks, may be used. Such a path, however, retains moisture, and the sawdust gets carried into the house.

PHOTOGRAPHIC PLATES: TO DEVELOPE. (1) *Pyrogallol developer:* (*a*) Mix 100 grms. crystallised sulphite of soda with 500 c.c. distilled water, and 8 drops concentrated sulphuric acid. When the soda is entirely dissolved, add 14 grms. pyrogallic acid. (*b*) Mix 50 grms. crystallised carbonate of sodium (soda) with 1000 c.c. distilled water. This must be kept in a well-corked bottle. For use, mix 20 parts (*a*) with 40 parts (*b*), and then add 2 or 3 drops potassium bromide. For over-exposure add more bromide or less (*b*); for under-exposure do not add bromide unless the plates are fogged. Begin developing with a partially used-up developer. To obtain soft plates, add water up to 50 per cent.

(2) *Hydrokinone developer:* (*a*) Mix 40 grms. crystallised sulphite of soda with 600 c.c. distilled water, and then add 6 grms. hydrokinone. (*b*) Mix 50 to 70 grms. carbonate of potash, or 50 to 100 grms. carbonate of soda with 600 grms. water. The more potash used the quicker the developer will be. For use, mix equal parts (*a*) and (*b*), and add a few drops of a 10 per cent. solution of potassium bromide. A small addition of yellow prussiate of potash makes clearer work, and hastens development. The developer when mixed keeps good, if well corked, for about a week. This developer must work at a temperature of at least 60° Fahr.; and it is slower than No. 1, unless caustic soda or potash be added, when it becomes very rapid.

The exposed plate is taken out under a red light in a dark room, and laid film upwards in the bath. The developer is then poured over it, so that it covers it immediately. In rocking the dish the plate should always be kept immersed, and even with the best red glass obtainable it is advisable to work as much as possible in a shadow. If after long development details are indistinct, the plate has been under-exposed, and it should then be moved into

a bath without bromide. If the picture appear quickly and soon passes away, the film turning gray all over, the plate is over-exposed. In this case add potassium bromide, and begin with an old or diluted developer. The plate will be developed sufficiently when it appears darker to look through than it does after being fixed.

PHOTOGRAPHIC PLATES: TO FIX. Mix 100 grms. hyposulphite of soda with 500 c.c. water and 25 to 50 c.c., acid sulphite of soda. The addition of acid is not necessary, but very beneficial, and by the repeated additions of it the bath can be used much longer. After the plate has been fixed in the hypo. bath, it should be washed in running water for an hour. Then put it in a rack to dry, and remove any impurities with a stiffish paint brush while the gelatine is still moist. To dry plates rapidly, drain most of the water from them, then immerse for 5 to 10 mins. in strong alcohol, and the plates will be dry 10 mins. later. Particular parts of plates, which are too dark, can be reduced by rubbing with a linen cloth moistened with strong alcohol (95 per cent.). The plate may then be varnished. [*See* VARNISH (PHOTOGRAPHIC)]

PHOTOGRAPHIC SENSITISED PAPER: TO PRINT. Place the sensitive paper behind the negative plate, the two prepared surfaces together, and place in the strongest light obtainable. In damp, foggy days, place a piece of filter paper dampened with a solution of carbonate of soda behind the sensitive paper to prevent it turning yellow. Printing is complete when all details in the high lights are distinct, and when the whole print is slightly darker than the picture is to be when finished. The proper degree of printing can only be told by experience, for it depends on the character of the paper, negative and bath. When the paper is printed, lay it in a dish with ordinary water, and rock frequently. After about 10 mins., when the water has become quite milky, pour it off and add fresh, and so on until the water remains clear. The print is now ready for toning.

PHOTOGRAPHIC SENSITISED PAPER: HOW TO TONE AND FIX. (1) *Borax toning bath:* (*a*) Dissolve 7·5 grms. borax in 1000 c.c. distilled water. (*b*) Dissolve 1 grm. double salt of gold and soda (commercial chloride of gold is nearly always this double salt) in 50 c.c. distilled water. For use, mix 200 c.c. (*a*) with 3 c.c. (*b*), and use immediately. Phosphate of soda may be substituted for the borax.

(2) *Commercial toning bath:* (*a*) Dissolve 1 grm. borax in 1000 c.c. distilled water. (*b*) Dissolve 4·5 grms. re-crystallised acetate of soda in 1000 c.c. water. (*c*) Dissolve 1 grm. double chloride of gold and soda in 50 c.c. distilled water. For use, mix 50 c.c. (*a*), 50 c.c. (*b*) and 4 c.c. (*c*) for every sheet to be toned.

(3) *Combined toning and fixing bath:* Mix together in the following order 2000 c.c. distilled water, 500 grms. hyposulphite of soda, 55 grms. sulphocyanide of ammonium, 20 grms. acetate of lead, 15 grms. powdered alum, 15 grms. citric acid and 20 grms. nitrate of lead. Allow this mixture to stand for a week; then filter, and then mix with it 150 c.c. solution of 1 part gold chloride in 200 parts distilled water.

(4) *Fixing bath:* Mix 100 grms. hyposulphite of soda with 500 c.c. water. The prints after being printed, and then soaked in water have a reddish tint, which should be removed by immersing them in the toning bath No. 1 or 2. This toning should preferably be done

in weak daylight, as the colour of the print can then best be judged. The liquid being placed in a bath, the prints are placed in it one over the other, surface side uppermost, every print being entirely immersed. As the prints are toned to the colour of a finished photograph, they are dipped in a dish of clean water, and they are then all toned together in No. 4, being run through the fixing bath one after another, and being left in from 10 to 15 mins. The bath should be frequently rocked and generously supplied with fresh mixture. Toning and fixing may also be carried on in the same bath at the same time. The drawback is that after some time the prints are toned in it, but not thoroughly fixed. It is therefore best to finally fix in the hypo. bath No. 4. The advantage is that the desired tone can more easily be obtained by the inexperienced, than when using two separate baths. After fixing, the prints are put in a large vessel with clean water for about 3 hrs., the water being changed at least once every 10 to 15 mins. Preferably the prints should be placed under running water for 2 to 3 hrs. The prints are then hung up to dry, or dried between filter paper, which should be changed several times while they are drying. They are then trimmed up, and may be made slightly damp again, and pasted on to mounts.

PHOTOGRAPHS: TO COLOUR. (1) If the photograph be mounted, soak it off the mount. Make a paste of 14 parts water to 1 part starch, and boil it till transparent. Cut two pieces of thin glass the size of the photograph. When the photograph is quite dry, spread the paste on both the face of the picture and on one piece of glass, and lay the two pasted sides together. Cut two thicknesses of good wrapping paper, put them on the back of the photograph and work out the paste from the centre towards the edges, changing the paper as soon as it becomes sticky. When dry cover the photograph with castor oil till transparent, and remove the surplus oil with a sponge. Paint the prominent parts (in a figure the eyes and jewelry) on the photograph side with water colours. Cover this with the other piece of glass, and paint on the second glass with oil colours all the other parts, having put small pieces of cardboard on all sides of the second glass to keep the two glasses separate. (2) Cover an unmounted photograph with castor oil, and leave it under pressure between two sheets of cartridge paper till all surplus oil is removed. Then paint on the back as if for a magic lantern slide. [*See* MAGIC LANTERN SLIDES] This method is harder and sharper than No. 1. (3) Dissolve Canada balsam in benzol, and use instead of the castor oil.

PIG PEN: PORTABLE. Cut two pieces of 6 in. × 8 in. timber 14 ft. long; dress one end of each in the form of a sled runner, and lay them parallel, with the 6 in. face on the ground, 8 ft. apart. Cut two pieces of 4 in. × 4 in. scantling 9 ft. long, and halve or tenon them into the runners crosswise, so that they lie flush on the top of them, thus keeping the runners 8 ft. apart. Lay on a floor of $\frac{3}{4}$ in. deal over one half of the surface, *i.e.*, over 8 ft. by 7 ft. Mortise in six uprights made from 4 in. × 4 in. wood 6 ft. 6 in. long, placing one at each end and one in the middle of each runner; make these uprights flush on the outside with the runners. Nail 1 in. match-boarding on the inside, dividing the whole with a cross partition on the line of the floor and the two middle uprights. Roof over the floored half, and

make a sliding door in the partition, so that the pigs may be shut in or out as desired.

PIGEON HOUSE. Cut three pieces ¾-in. deal 2 ft. long × 1 ft. broad; nail them side by side on to two cleats 1 in. × 1 in. × 3 ft. long to make the bottom, which will be 3 ft. long × 2 ft. broad. Cut four pieces of ¾ in. deal 12 in. broad × 20 in. long on one side, and 29 in. long on the other, as shown in Fig. 1. Nail two pairs, long sides together, on cleats for the two ends. The four horizontal side bars should be made from 1 in. × 1 in. deal; the top horizontal piece of 1 in. × 1½ in. deal. Put verticle bars in of thin wood as shown, or iron wire, or wire netting. The netting is the quickest, but does not make such a neat job. The back half of the cage may be boarded over with ½-in. deal instead of open-work; the solid half, roof and back has the advantage that when the sun is strong the box can be turned round, so that the birds are in the shade. Make a door in the back to clean out the cage. The two nest boxes, one on each end, should be made 18 in. broad × 9 in. deep × 16 in. high on the side touching the end, and 11 in. high on the opposite side, to give 5 in. slant to the roof. Let the roof project about 1 in. all the way round for eaves, and fix them on to the ends of the cage as shown in the illustration. It is best to have them detachable. Mark off and cut out with a key-hole saw the holes for the birds to enter the boxes, say about 4½ in. broad × 7 in. high. The top of the holes may be made semi-circular as shown.

Fig. 1.

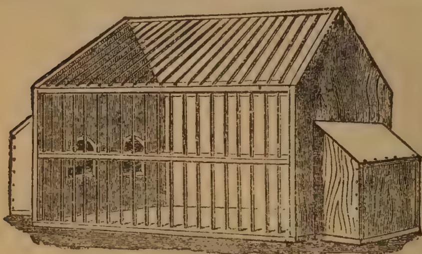


Fig. 2.

PIGEON MARTIN BOX. A ¾-in. deal board 9 in. broad × from 8 to 10 ft. long will be sufficient for the whole box. Make the highest part of the roof the same height as the length of the floor; make the breadth of the floor ¾ of the length. For example, cut a board 9-in. broad × 12 in. long for the floor. Cut two end pieces from a 9-in. board 9 in. high at the sides and 12 in. high in the middle, as illustrated. Cut the sides 9 in. high × 13½ in. long. Let the roof overlap the sides and ends about 1 in. for eaves. Cut an entrance hole in both sides

about 4½ in. broad × 7 in. high with rounded tops. A board 4½ in. broad × 9 in. long may be nailed on to the bottom of the box, so that 6 in. projects beyond the hole, for the birds to alight on, and to place food. One end should be hinged to allow for cleaning. Inside place a small rough box near the unhinged end for the bird to

nest in. The bird will collect her own materials for building the nest. Fill up the crack along the peak of the roof with pitch. Give a first coat of white-lead paint all over the outside, and a second coat of light-coloured paint to suit fancy. For further hints on building *see* KENNEL (DOG). This box may be placed on the top of an upright post, which should have the bark left on, but about 6 ft. from the ground a plate of zinc, brass or galvanised iron 2 ft. in depth should be nailed entirely around it, to prevent cats from climbing up. The box is best placed among trees or bushes, but care must be taken that it is not placed so near them that a cat can jump from a bush or tree on to the structure above the metal.

PIPES: HOW TO PROTECT LEAD. When lead pipes pass through a wall, they should be laid in plaster of Paris. In frosty weather cover the pipes with hay or straw bands. Drain all the water out of the pipe if possible, or keep the water running continually.

PIPES: TO THAW FROZEN. Crumple a newspaper into a torch, light it and pass it along the pipe slowly.

PLANES: TO SELECT. The grain lines at the end of the plane should be far apart. The timber should have been split not sawn; this can be seen by following the grains on the surface. Reject those planes on which the grain seems crossed.

PLANTS: DOUBLE POTS FOR. Many plants in pots are greatly benefited by placing the pot containing the plant into a larger pot and filling up the space between the pots with earth or sawdust. This outside earth or sawdust should be kept moist.

PLANTS: HOW TO REPOT. Invert the plant, and hold the hand over the earth, then hit the edge of the pot lightly by bringing it down on a table. If the roots be matted round the sides and bottom, the plant needs repotting. Carefully reduce the earth to about $\frac{1}{3}$ of its original size, single out the matted roots and trim off all that is decayed, and then repot in a larger pot. If the roots be not matted, repot the plant without breaking the earth in a larger pot. A newly-potted plant must be kept in the shade, and well watered.

PLANTS: TO THAW OUT. Allow the plants to remain where they were frozen, and darken the room. Do not allow the room to become warmer that 45° Fahr. for 24 hrs. Put 2 or 3 drops of spirits of camphor in a watering pot of water and water the leaves.

PLANTS: HOW TO TRANSPLANT. If possible transplant just before a shower, just before night, or on a cloudy day. Move the plants when the earth is neither very dry nor very wet, and do not transplant them into mud. It is best to plant them in the ordinary way, and then give a good watering.

PLASTER. To make a good wall good materials must be used on good laths. Clean sand only should be used, and if it be dirty, it should be thoroughly washed.

First coat: Mix 6 barrels of sand, 1 barrel unslaked lime and 7 lb. hair (goat hair is preferable to cow hair).

Second coat: Mix 8 barrels sand, 1 barrel lime and 7 lb. hair.

Last coat: Sift $\frac{1}{2}$ barrel best white lime through a fine sieve, place it on a board, and hollow it out; then add from $\frac{1}{8}$ to $\frac{1}{4}$ barrel plaster of Paris, and work up with water. Each coat of the mortar must be thoroughly mixed with a hoe, not merely stirred round with a stick. If the plaster cracks on drying, too much lime has been used in the last coat; if it sets too

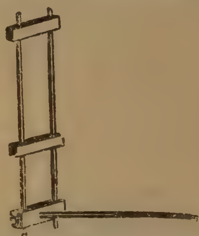
thick, too much plaster of Paris has been used. The above quantities are sufficient for 60 sq. yds. of wall, for which 1,000 laths and 7 lb. nails will be required. If walls be plastered in frosty weather, fires should be kept in the room till the walls are quite dry. Expanded metal is being used very largely to take the place of laths for ceilings. The metal should rest from girder to girder, and it should be placed as near the bottom of the plaster as possible, but it must be entirely embedded. When metal is employed, only the best lime cement should be used. Cover the floor with about ½ in. sand to prevent lime stains on the wood.

PLASTER: TO KEEP. Cover the mixture over, and keep it moist in a cool, damp place. Work the mortar over with a hoe periodically, to keep it from setting. To keep plaster of Paris from setting for about 15 mins., add 1 part saturated solution of borax to 12 parts of the water with which the plaster is made. The more borax solution there is added to the water the longer the plaster will take to set.

PLASTER: OLD LATHS, ON. Jar the old laths till all the sand, etc., has dropped off, brush thoroughly with a stiff broom, and then dampen them. The new plaster should then be applied as if the laths were new.

PLUMB BOB. For most purposes a bright nut tied across one of the corners with fine whipcord makes a sufficiently accurate plumb. The bottom will then have a sharp edge, and is far more accurate than a cheap plumb. To test a plumb, hang it upon a long nail; take a piece of thread longer than the plumb string, tie a weight to the end, and hang it up in front of the plumb. Sight across the two threads, and then see if the sharp point at the bottom of the plumb is in the centre of the thread in front. Another way is to twist the string round quickly, and see whether the point of the plumb describes a circle when the rest of the weight seems steady.

POKE: HORNED ANIMAL. This is a stronger poke than that described for POKE (HORSE). The top bar is made movable, to fit the poke over the animal's neck,



and is kept in place by pins. The poke should be deep enough to come nearly down to the animal's knees. This poke is also suitable for horses.

POKE: HORSE. Cut a piece of green flexible wood, such as ash or yew, about 3 or 4 in. diameter, and split it down the middle. Measure the length round the horse's neck, as for a collar, and cut the wood accordingly. The illustration gives a good idea of the construction. The double pins are put in to keep the projecting stick in front of the horse, and save him from beating his knees. When the animal attempts to jump, the pin catches under the rail and holds him down.

POKE: SELF-SUCKING. (1) Cut six bars of a sufficient length

to extend from the animal's head to its shoulder. Bore a hole in each end of each bar, and thread them on ropes round the animal's neck as a collar. Keep the bars at the proper distance apart by knots in the rope. (2) Cut a thin piece of wood, 2¾ in. wide × 4½ in. long; hollow at one side near the edge, so as to form two lobes. The distance between the knobs of the two lobes is about ¼ in., just enough to permit their being pressed over the thick cartilage of the nose, and close enough to keep in place. It hangs down over the cow's nose, and prevents her getting the teat into her mouth, but does not hinder feeding. (3) Select a strap of suitable size to be buckled on to the smallest part of the cow's head between the nostrils and eyes. Drive six nails through the leather from the inside; file the points sharp, and then line the strap with another piece of leather to support the nails, and rivet them both together. Strap it on the cow's head, so that the nails project in front.

POLISH CHAINS: TO. To polish chains, etc., place the chain in a bottle with chalk tooth-powder, water and soap. Put the stopper in, and shake till clean.

POLISH: CLOTHES BOX. Dissolve gum-camphor in sweet oil, and use as an ordinary polish. This polish drives away moths.

POLISH: FRENCH. (1) Place 2 oz. bleached shellac and ½ oz. sandarac in a bottle with ½ pt. methylated spirits, and shake it up now and again till the gums are dissolved. (2) The usual cheap polish is best transparent shellac varnish. (3) Dissolve in a hot water bath 2 oz. bleached shellac, 1 oz. pale benzoin and 1 oz. juniper in 1 pt. methylated spirits. When cold, decant the clear liquid, and strain through a fine muslin bag lined with wadding. To clarify any French polish if it appear turbid *see* VARNISH (SHELLAC). To apply the polish *see* POLISH WOOD (TO).

POLISH: FURNITURE. *Cream:* (1) Boil and mix 4 oz. beeswax shavings and 2 oz. yellow soap shavings in 2 lb. water. When dissolved add 1 oz. pearlash, 5 oz. turps and 4 oz. boiled linseed oil. Apply the cream, and polish it off with a linen pad; then rub briskly with tissue or silver paper. (2) Boil 4 oz. soap shavings and 1 lb. beeswax shavings in 1 gal. soft water, and when dissolved add 2 oz. pearlash. To apply, dilute with water till as the consistency of paint; apply it with a brush, and then polish off with a soft cloth. (3) Dissolve beeswax shavings in turpentine, and then add a little boiled linseed oil. Apply a little on a linen pad, and polish the furniture till dry. This polish is also used for floors and stained wood, no preparatory polish or varnish being necessary.

Oil: Oil furniture polishes should be only used when the furniture has a moderate body of polish on it. (1) Mix 2 parts boiled linseed oil, 2 parts alcohol, 1 part turpentine and 1 part spirits of ether. (2) Mix 1 part turpentine, 1 part linseed oil and 1 part vinegar; 1 part alcohol may be added to thin. (3) Place alkanet root in a pot and pour boiled linseed oil over to just cover it; then boil till the oil is of a rich red colour. This polish is more especially suitable for mahogany and red coloured woods. (4) Slightly moisten a cloth with kerosene oil, and polish. This is unsuitable for varnished articles.

Tripoli: Place 2 oz. powdered tripoli in an earthen pot, and just cover it with water. Lay a piece of flannel over cork or rubber, to form a pad, and polish with this mixture. Wipe the work with a sponge, and if there be an even gloss, clean the surface with

mutton fat or suet. This polish is particularly suitable for varnished surfaces, but it should not be applied too often or the varnish will be all rubbed off.

Varnish: These polishes should be applied very sparingly with a soft cloth, and then the wood polished with a circular motion till dry. Properly applied they are the best polishes. (1) Dissolve ½ oz. gum-arabic, 2 oz. gum-copal and 2 oz. powdered shellac in 1 qt. spirits of wine. Shake the bottle up periodically till the gums are thoroughly mixed and keep the bottle in a warm place. (2) Mix 2 parts shellac varnish with 1 part linseed oil, and shake the bottle before using. (3) Dissolve 1 dr. camphor in 1 lb. shellac varnish. This polish is very suitable for painted or stained surfaces, such as the panelling round a room. The paint must be perfectly dry before application, but it may be washed afterwards.

POLISH IVORY, HORN, ETC.: TO. To polish whole tusks or horns, mix whiting with vinegar or methylated spirits to a cream, and apply it briskly with a stiff nail-brush, or on a piece of felt nailed to a wooden back. When all surface marks have been removed, polish with chamois leather and dry whiting.

POLISH: LEATHER. *Brown Cream:* Mix 20 fluid oz. best white vinegar with 10 fluid oz. soft water, and dissolve 2 oz. glue in it at a gentle heat; then add 1 dr. soft soap, 1 dr. isinglass, and boil; finally colour with annatto or turmeric as desired. This polish will be found very suitable for brown leather boots, etc.

Enamelled: Warm separately 1 pt. cream and ½ pt. linseed oil; then mix. Apply with a sponge, and polish with a soft dry cloth.

French: (1) Beat 4½ oz. stearine out into thin sheets with a mallet, and mix it with 6½ lb. turpentine. Heat up as glue in a water bath, and while heating, stir continually. When hot gradually add 3 oz. colouring matter, such as ivory black. Pour it out into another pot, and stir till cold. To use, warm slightly, and rub a very little on to the leather; when partly dry polish with a silk cloth. This polish is very suitable for best harness and similar leather.

Old: Soak 2 parts glue in tepid water till soft, add 3 parts Castile soap dissolved in warm water, then add 5 gills water and 2 gills spirits of wine, rubbing until perfectly smooth; afterwards stir in 2 parts flour mixed smooth in cold water. Put the mixture over a fire to steam, stir continually, and do not allow it to boil. It can be used immediately, or cut up into cakes, which may be dissolved in water or beer. Apply and polish as for all leather polishes.

Patent: Mix together whites of two eggs, 1 tablespoonful spirits of wine, 2 large lumps sugar and finely-powdered ivory black. Apply with a sponge, and then polish with a soft cloth.

POLISH: METAL, PASTE. (1) Pulverise 1 lb. chalk or whiting in 2 qts. water, and leave it for a few minutes till the gritty parts have settled to the bottom. Decant into another vessel, and let it stand till the whiting has settled to the bottom; then pour off the clear liquid, and dry the paste that is left. Then pulverise the prepared whiting again, and mix it with 1 oz. jeweller's rouge, 8 oz. soft soap and 8 oz. prepared suet. (2) Mix 1 oz. jeweller's rouge and 1 oz. blacklead with 1 oz. prepared suet. (3) Pulverise 2 oz. rotten stone to an impalpable powder, and mix it with 1 dr. oil of amber and 1 oz. soft soap. (4) Heat 1 oz. sulphate of iron and 1 oz. salt in a closed vessel slowly. When fused to a

hard brittle mass, powder, and mix it with about 1 oz. prepared suet or lard.

POLISH STONE: TO. Face up the surface as near as possible with a chisel. Then select a piece of stone at least as hard as the stone to be polished, and with a flat surface, and rub it over the surface to be polished, applying coarse sand and water freely, till it is evenly scratched all over. Glass is sometimes used instead of the polishing stone. Then apply finer sand and water; then coarse emery powder and water; then fine emery and water on a pad made from a flat weight wrapped in felt (an old felt hat answers admirably). Then rub with putty powder applied on rags, and when the polish begins to come up free from scratches, continue polishing, but do not add any more powder.

POLISH VARNISHED ARTICLES: TO. Rub the varnish with a piece of dampened serge dipped in pumice stone ground to a *very* fine powder. Then polish with POLISH (FURNITURE: *Tripoli*). Clean with a dampened flannel dipped in whiting, and smooth over with the palm of the hand.

POLISH: VULCANITE, CELLULOID, ETC., TO. Remove all deep surface marks with emery cloth, and blow away all dust. Then rub over with powdered pumice stone and water applied on a linen pad; wash off all pumice powder, and then polish as before, substituting putty powder for pumice powder. This is a sufficiently good polish for ordinary work; but for very fine work, rub over with lampblack and refined sperm oil, using the palm of the hand for a pad.

POLISH WOOD: TO. The wood must first be made perfectly smooth with the finest sand-paper, for a scratch will show far more after the wood is polished than before. The pores of the wood must then be filled up with plaster of Paris. Roll a rag up into a pad, dampen it with water, and then dab up some plaster on it. Rub this well into the pores of the wood, a little at a time, and remove all unnecessary plaster before it sets. Instead of water, linseed oil, or linseed oil with polish added may be mixed with the plaster of Paris to fill up the pores of the wood. Leave the plaster to dry, and then go over lightly with No. 1 glass-paper, and blow away all dust. Saturate cotton-wool with linseed oil, and go over every part that appears white; then remove *all* the oil possible with clean, dry linen. Roll up cotton-wool tightly into a pad, saturate it with the French polish [*see* POLISH (FRENCH)], and cover it with a thickness of calico. Then pass the pad smoothly over every part, so that a thin coating of polish is applied evenly all over the wood; then place the wood away for the polish to sink in and become hard. When the wood is dry, rub it down again with No. 1 or No. 1½ sand-paper, and if the surface be flat, polish with a cork rubber. The true polishing is now commenced. Take an old pad (which is made from cotton-wool rolled up, covered with calico, and tied up in a bunch at the top to hold it by) from out of the air-tight tin in which it should always be kept, slightly dampen the cotton-wool with polish, and put a dab of linseed oil in the centre of the calico with the tip of the finger. Polish round and round in small circles, or figures of eight, occasionally sprinkling pumice powder sparingly on to the wood. The pumice powder should be kept in a small cambric bag, called a "pounce" bag, and gently shaken for some of the powder to work through, The bag should always be hung up.

so that no foreign matter is shaken off the bottom on to the wood. As little oil as possible should be used, or the polish will not finally appear clear; only just enough should be applied from time to time to keep the pad from sticking. Rubber after rubber should be used, always applying less polish to them as the work proceeds. When the polishing nears completion, a dull smeary appearance will be noticed, and the rubber will catch on the surface. When this is noticed, set the wood away to dry upside down, so that no dust falls on it, for two or three days. If the polish be now looked at sideways it will be seen that it is pitted, due to the polish sinking into the pores of the wood. The surface must therefore be lightly smoothed down again with No. 0 sand-paper till level. Now continue polishing as before, and after some time the polish should come up clear and hard, but perhaps a little smeary. Set aside again for two or three days. Then choose an old rubber, apply equal parts of polish and best methylated spirits to the cotton-wool, and a drop of linseed oil on the calico. Draw it over the surface so as to only just dampen it with polish, and then polish finally till the surface comes up transparent. Sometimes a final polish is given with spirits only. This is risky for a beginner, as the whole of the polish may come off, and the work have to be commenced again from the beginning; but if successfully applied, the finish is superior to any other. It is known as "spiriting off". To give a dull finish, proceed as in the ordinary way till just before spiriting off. Then allow it to stand for 12 hrs. Pulverise pumice stone to powder, and place it in a pounce bag. Place a drop or two of oil on the polishing pad, and then pat the bag to shake out a little powder on to the work or on to the pad. Then rub round as before till the surface is as desired. For carved work, apply the powder and oil with a stiff brush. Then wipe dry with clean cloths. Another way is to polish to completion by the ordinary method; then dampen the surface with spirits, just enough to "bite" in, and dab all over with a stiff brush. This is suitable for old oak. Wood may be more readily polished in a lathe than a flat surface by hand. The faster the wood rotates the better, so long as the polish is not "fired". Use a rubber, polish and oil in the ordinary way, pressing lightly at first, and harder as the work nears completion. To polish fretwork, place a flat surface, such as a coin, in the pad, so that it does not catch on the edges and corners. Besides the fillers already given teak may be filled thus: steep 4 oz. alkanet root in 1 pt. linseed oil, and rub it over the wood. Then rub in with very fine whiting mixed with Venetian red or rose pink to match the wood. For oak, mix whiting with yellow ochre to match the tint of the wood. The temperature of the polishing room should be not less than 65° Fahr.; it should be dry and free from dust, etc., more particularly road dust.

PORCELAIN: TO WASH. Thoroughly pulverise fuller's earth and remove any hard grains. Mix with water, and wash the porcelain.

POT-POURRI. Spread rose petals out in the sun to dry; then sprinkle over them a little salt, and put them into the jar in which they are to be kept till wanted, and cover up air-tight. With every 4 oz. of these petals mix 8 oz. lavender flowers, 1 dr. bruised vanilla cloves, 1 dr. bruised benzoin, 1 dr. bruised storax, 20 grs. ambergris and 20 drops otto of roses.

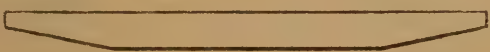
PRINTS FADING: TO PREVENT. Dissolve 3 gills salt

in 4 qts. hot water. Place the cotton prints in while hot, and leave in till cold. Hang the prints up to dry before washing. This salt bath need only be given before the first washing.

PROPAGATING BOX. Make a wooden frame with one side higher than the opposite side, the intermediate sides sloping to match, and cover with a large sheet of glass. Lay about 2 in. sand all over the bottom, which must always be kept wet. Keep the glass always on, but place the whole box in the shade. Plants or cuttings taken from the box must be kept in the shade for a few days when placed in the open. This box is really a small hot-bed without manure in the bottom. [*See* HOT-BED]

PUMPS: LEATHER PACKING FOR. The leather packing or piston ring for small work should not be more than $\frac{1}{32}$ in. thick, and should not be bent up the sides of the cylinder more than $\frac{1}{16}$ in. If the suction fail, put tallow on the packing; if this does not answer, take the leather out, bend the flap in the opposite direction, so that what was the inside of the leather works on the surface of the cylinder.

PUNT. Cut two lengths from $1\frac{1}{4}$ in. deal 10 ft. long × 9 in wide for the sides. Mark off a point 2 ft. 3 in. along one edge from one corner, and from the opposite corner mark off 4 in. along the end. Join up these two points, and cut brass screws, and then plane the four slants just sawn off, and the bottom of the two ends so that they continue in one plane. Paint the frame with white-lead paint before and after being put together. Cut twenty-three pieces from $\frac{3}{4}$ in. deal 3 ft. 1 in. long × 6 in. wide, and lay them crossways on the bottom of the sides to form the bottom of the boat. Nail one in place with copper nails, beginning from one end, and lay some calico steeped in pitch along the side; then nail on the next bottom board, crowding it up to the first, and so squeezing the calico as tight as possible. Continue thus till the bottom is finished; then plane off the two end bottom boards in a line with the slant, so that the end boards will lie flush. Nail the end boards in place in the same way. Saw off all pieces of board that project over the sides along the bottom and ends, and then plane up flush. Along the centre of the boat, 8 in. apart on the inside, screw down two stiffening pieces of pitch pine 2 in. × 2 in. × 5 ft. 6 in. Put the punt in the water, and if there be any bad leaks, plug with hemp (made by scraping the end of a rope) well soaked in tar. Take it out and let it dry, and then paint first with two coatings of white-lead paint, and then a coat of any colour desired. A seat 12 in. wide at either end may be permanently fixed on cleats, and another movable one, resting on cleats, may be placed 4 ft. 6 in. from one end for rowing



off the triangle thus made. Cut a similar triangle off the other end, as shown in the illustration. Cut two pieces from $1\frac{1}{4}$ in. deal 3 ft. long × 4 in. wide for the ends. Screw them firmly in place with

Put in rowlocks to suit sculls. A good punting pole may be made from bamboo shod with iron.

PUTTY. Where it is desired to fill up a hole with putty, run over the surface with sand-paper, so that

the hole gets partially filled with dust, and then apply the putty with a putty-knife. In this way the putty does not bed hard against the bottom of the hole, and a nail can draw a little without moving the putty. If the surface is to be painted, apply a coat before putty-ing, and then give two more coats of paint. Another way is to moisten the hole, so that the wood swells, and when it is dry, apply the putty. When large cracks in painted wood have to be puttied, mix glue with it, and do not smooth down until it has thoroughly set. Putty adheres best to a painted surface. The putty should always be made some time before it is required for use. It should be kept in a damp cloth in a cool cellar, or under water, or in oiled silk, or in good paper saturated with linseed oil. Should it become dry, it should be hammered up with fresh oil. The excellence of the putty depends on the amount of hammering, and the complete amalgamation of the ingredients.

PUTTY: BREAD. Macerate bread with gum and a little glycerine or rubber cement, and colour it to imitate the wood. Rye bread makes the hardest putty, which forms an excellent filler for wood. This composition may also be cast into panels, to imitate carved wood. When dry, apply oil, rubbing it in with the hand.

PUTTY: CEMENT. Mix white oxide of zinc with linseed oil varnish. This forms a very hard putty, and is useful for uniting glass and metal.

PUTTY: HOW TO COLOUR. Moisten the colouring matter with oil, and then knead it into the putty.

PUTTY: COMPO. (1) Mix fine sawdust with glue, and crowd it well into the joint. [*See* WOOD, (GRAINLESS)] (2) Scrape 4 oz. beeswax into a vessel, and add sufficient turpentine to moisten it all; then add ¼ oz. powdered resin and as much pigment as is necessary to give it the required colour. (3) Melt 6 parts shellac, 2 parts resin, and 1 part beeswax, and mix in the required pigments to match the wood. Cast it into sticks as sealing wax, and run it into the shakes and holes with a hot iron.

PUTTY: LEAD. Thoroughly pulverise best dry white lead; mix half of it with brown japan till very soft; then mix as much of the remaining half with it as is necessary to bring it to the required thickness. Pound the putty with a broad-faced hammer till all lumps have disappeared, and the putty has become soft and elastic. Then knead the putty in soft water for about 15 mins., and afterwards work it out of the water for a few minutes longer.

PUTTY: TO REMOVE OLD. (1) Apply a hot iron to the putty, when it will become soft, and it can then be readily removed with a knife. (2) Paint with nitric or hydrochloric acid, and leave for 1 hr., when the putty will be soft. [*See also* PAINT (*Removing*)]

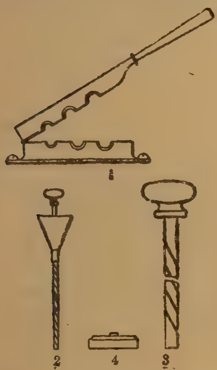
PUTTY: SLOW DRYING. To prevent the putty hardening quickly, mix 10 parts Spanish whiting and 1 part white lead in boiled linseed oil; then add a little sweet oil.

PUTTY: TO SOFTEN. Break the lump into pieces the size of a hen's egg, add a little linseed oil, and then enough water to cover. Boil for about 10 mins., stirring while hot, and then pour off the water. [*See also* PUTTY (TO REMOVE OLD)]

PUTTY: SPANISH WHITING. Mix Spanish whiting with raw linseed oil, and then pound with a hammer till plastic. White lead and linseed oil make a much better putty.

PYROTECHNICS. Nearly every fire-work is made in the form of a composition contained in a paper case. The case is made by

rolling paper round a "former," and this former should in most cases be made of brass. It should also be about 8 in. longer than the case is to be. A choking machine is also required, which is shown in Fig. 1 in the illustration. It can readily be made from hard wood faced with brass on the principle of a lemon-squeezer. Two sieves of copper or brass gauze are required—one for mixing the ingredients, having about 20 meshes to the inch, and another for sifting, having about 40 meshes to the inch. A fine hair sieve answers well for the mixer, and a muslin sieve for



the sifter. Copper funnels are required for filling the pipes or cases with the chemicals. These should be made of various sizes to suit the work, and they should have the spout tapering, so that a good joint can be made between the paper case and the funnel. A good general size is 2½ in. across the mouth by 4 in. high. The smaller-sized funnels should have the spout longer in proportion to their size than the larger funnels. To fill a case, the funnel is fitted into it, and a "rammer" inserted into the case through the funnel, as shown in Fig. 2. The chemical composition is then placed in the funnel, and the rammer lifted slightly up and down with a sharp jerky motion. Fig. 3 shows the rammer alone. The rammer should be made of a straight brass rod about 8 in. longer than the case and ⅔ of the inside diameter of the case. It should be a good working fit in the spout of the funnel, and should work in it perfectly smoothly and without catching. A spiral groove is cut round the rammer as shown in Fig. 3. This allows of powder being carried down through the funnel into the case. For very long rammers of a small diameter, notches must be cut instead of the spiral, and they should then be made of steel wire, as brass would not be stiff enough. The end of the rammer should be filed off square, and then polished with emery-cloth. The head or handle should be made of boxwood, or better still, of gun-metal or lead covered with leather, and it should be made of a convenient shape so that it can be held between the thumb and second finger with the first finger resting on the top. The "nipple" (Fig. 4) is made from a brass rod of the same diameter as the former driven into a heavy base with the end filed off square, and polished with emery-cloth. Thread is required for tying the ends of the cases, and perhaps the best is that used by shoemakers, and known as hemp. Red carpet thread is often used as it gives a better finish to the work. To store the chemicals tin boxes are suitable for charcoal, etc., but for explosive compositions glass bottles are preferable. If glass stoppers be used, care must be taken to see that the seating of the stopper is quite clean before inserting the stopper, or an explosion may result. All bottles and tins must be kept quite dry. When using the chemicals, only a little should

be emptied out at a time, and the stopper then replaced. No knife or any iron or steel should be sharpened near the chemicals, and for safety it is better to cut up all paper, etc., in another room. Absolute cleanliness is also very essential to safety. For the same reason chemicals should be bought in very fine powder, except where otherwise stated, and they can then be mixed by sifting them two or three times through the mixing sieve. In that case no mortar and pestle need ever be used. In very few cases only can the chemicals be mixed too much. Only the best lampblack should be purchased, for inferior qualities have been known to "sweat," and burn from spontaneous combustion. Before attempting the manufacture of any fire-work, one or two should be bought as a guide, and taken to pieces.

Bengal Fires: The best size for these is for the case to be 1¾ in. internal diameter × 4 in. long. The best paper is 35 lb. brown bag cap paper, and from each sheet 12 pieces 9¾ in. × 4 in. can be cut. The strip should be pasted at each end along the edges which are 4 in. long, but on opposite sides of the sheet. A brass former 1¾ in. diameter × 1 ft. long is placed about 2 in. from one end and exactly parallel to it. This end should then be bent up over the former and the former rolled round, so that the paper is rolled into a tube. The paper should be pasted to itself at the end of the first turn, and also at the last turn by the two strips previously pasted. The case should then be placed away till perfectly dry. Cut a wooden drift so that it is a loose fit in the case, and when the case is dry place a piece of paper a little larger than the diameter of the case over the end of the drift; rest the case on a flat surface, and press the drift and paper down to the other end. Then fill up the bottom ½ in. of the case with powdered clay, and hammer it down with a small light mallet and the drift. Then add more clay and hammer, and so on till the bottom inch or so is filled with compressed clay. One of the compositions given at the end having been selected, ½ in. or so is poured into the case, and hammered in the same way as the clay. This filling and hammering ½ in. at a time should be repeated till the case is full to the brim. Cut a square of thin blue paper a little larger than the case, and paste it over the top. The fire should be supported horizontally so that the red hot scoria may fall clear of the fire, and not interrupt its even burning. *White fire:* (1) Nitre 8 oz., sulphur (pure) 4 oz., black sulphide of antimony 2 oz. (2) Nitre 6 oz., sulphur (pure) 2 oz., realgar 1 oz. (3) Nitre 4 oz., sulphur (pure) 2 oz., orpiment 1 oz. *Chertier's white fire:* Nitre 8 oz., sulphur (pure) 2 oz., regulus antimony 3 oz., red lead 2½ oz. *Browne's white fire:* Nitre 12 oz., sulphur (pure) 3 oz., regulus antimony 2 oz., red lead 1½ oz., orpiment ½ oz., realgar ½ oz., finely-powdered metallic arsenic ½ oz., shellac ½ oz. *Golden yellow fire:* Barium nitrate 5 oz., sodium oxalate 1 oz., potassium chlorate 1½ oz., shellac 1 oz., sulphur (pure) ½ oz. *Red fire:* (1) Strontium nitrate 16 oz., potassium chlorate 6 oz., sulphur (pure) 4 oz., copper sulphide 3 oz., mercurious chloride 2 oz., shellac 1 oz., lampblack ½ oz. (2) Strontium nitrate 10 oz., potassium chlorate 3 oz., sulphur (pure) 2 oz., shellac 1 oz. *Green fire:* (1) Barium nitrate 16 oz., potassium chlorate 5 oz., sulphur (pure) 3 oz., barium chlorate 2 oz., mercurious chloride 2 oz., shellac 1 oz. (2) Barium nitrate 12 oz., potassium chlorate 3 oz., sulphur (pure) 2 oz., shellac 1 oz., mercurious chloride 1

oz., fine charcoal ½ oz. (3) Barium nitrate 8 oz., potassium chlorate 3 oz., sulphur (pure) 1½ oz., shellac ½ oz., realgar ½ oz., fine charcoal ½ oz. The effect produced by any of these formulæ depend on the absolute purity of the chemicals employed, and by their thorough incorporation.

Candles: Blue candles should be made from 13 lb. blue or white demy. Each sheet should be cut into 32 pieces, when each piece will be about 4 in. × 5 in. Cut up touch-paper ½ in. × ⅞ in. Lay out a sheet of paper on a quire or so of brown paper, paste the edge which is 4 in. long, and which should be farthest away from the operator, and place a brass former $\frac{3}{16}$ in. diameter about 1⅜ in. away from the edge which is not pasted. Underneath the former place one of the pieces of touch-paper, so that about ⅜ in. is beyond the side of the paper, and ½ in. between the paper and the former. Lift up the nearest edge of the paper, bend it over the former, and then roll the paper and former up evenly and quickly till the pasted edge is reached, which should finish the tube. When the tube is dry, fill it with one of the compositions either on a nipple in the ordinary way [*see Squib*], or rest the case on a table and spread the touch-paper out and fill from the other end with the funnel and rammer. When the case is filled to within about ½ in. of the end, make a small pellet of paper and press it down with the rammer; then dub the end over with a choking machine [*see Squib*], and dip an inch or so in the *Dipping Composition.* Finally twist up the touch-paper to a point. Compositions for blue candle: (1) Prunella powder 12 parts, sulphur 4 parts, regulus of antimony 3 parts. (2) Nitre 12 parts, sulphur 4 parts, meal powder 2 parts.

Crackers: 34 lb. royal hand-made paper is very suitable for the tubes, though any porous and unsized paper will do if it is not too tough. Cut each sheet into 6 pieces, each piece about 6½ in. × 12 in. Cut a length of No. 6 or 7 B.W.G. brass wire about 1 ft. 6 in. long for the former, and make the tube on the same principle as a pin wheel. [*See Pin Wheels*] If the paper be very porous, leave the paste to soak in for a minute or two before rolling the tube, and leave the tube 12 hrs. to dry. When the tube is dry, lay it down on a flat surface, the joint uppermost, and flatten it by drawing a smooth paper-knife over it from one end to within an inch of the other end. Then bend up 1 in. of the flattened end ready for filling. Bunch a lot of tubes together, and tie a sheet of paper round the mouth ends. Sift over the ends FFF powder, and tap and jar the tubes till they are full. Each individual tube should be tested to make sure that the powder is continuous in the tube by passing the fingers and thumb down outside. Those that are imperfect should be set aside, and remade with the next batch. Pinch the mouth of each perfect tube between the thumb and finger, and shake out all loose powder; then twist the end over. The powder must now be spread out perfectly evenly in the tube. To accomplish this a machine like a small mangle may be made, the only real difference being that the rollers shoule be able to be set a fixed distanch apart, not pressed together witd a spring as in a mangle. Two wooden rollers about 1 in. diameter should be fitted in a frame, and adjusted so that when the flattened tube is rolled between them they just spread out and cake the powder inside, but do not compress it. Another way, which does not give such a good result without

considerable practice, is to pass the paper-knife again over the pipe under pressure. The tubes must then be dampened as pin wheel tubes are [*see Pin Wheels*], and left in the damp calico for about an hour. A piece of $\frac{3}{4}$ in. boxwood should be cut as shown in Fig. 5. The slot should be 2 in. deep × 1 in. wide. This should be fixed to the table with the prongs projecting. Break up six knitting needles into 3 pieces each, so that 18 pieces of wire are formed. Take one of the dampened tubes and place one of the wires in the $\frac{3}{4}$-in. bend already made. Then place the tube on the bottom of the slot, and pull the tube, so that the wire is pulled up against the prongs. Then place another wire across the tube, but on the opposite side of the prongs, and bend the tube back over the second wire and between the prongs. Repeat this again and again till 14 zig-zags are made, when about $1\frac{1}{2}$ in. of tube should be over. Then press the cracker well down in the slot with a piece of 1 in. wood, so as to bend it to a permanent shape, and then remove all the wires. Cut off the last bend or leg of the cracker level with the others, but going to a point, like an inverted V, and tie on a piece of touch-paper immediately, which should be big enough to encircle it two or three times. The cracker is now ready for tying. First wind a piece of hemp three times round the length of the cracker, so that all the bends are held firmly, but not too tightly together; then pass it between the first and second bends, tying at right angles to the lengthwise tie first made; then tie between the second and third bends; then between the third and fourth bends, and so on till ended.

Dipping Composition: Make 2 lb. glue in the ordinary way rather liquid, and then add 1 lb. red lead gradually, and stir all the time, which should make a good smooth liquor.

Japanese Matches: Mix 5 parts lampblack, 11 parts sulphur and 26 parts meal powder in a mortar, and then add just enough weak gum water to make all to a stiff paste. When the composition is in this condition press it out, and divide it up into cubes about $\frac{1}{4}$ in. each way. Place these cubes to dry thoroughly but slowly. To light, nip one of the cubes in a small piece of split bamboo or fibre, and hold the cube over a candle till it begins to burn; then withdraw it.

Lightning Paper: Divide a piece of strong thin unsized paper into 3 or 4 pieces of a suitable size. Mix in a flat dish 4 parts sulphuric acid and 5 parts concentrated nitric acid with a glass rod. Immerse one of the sheets of paper in the acid for 10 mins., and then place it under a tap of running water till all the acid is removed; then wash in a weak solution of sodium carbonate, and rinse in clean water again. Dry carefully at a gentle heat. Treat the other sheets of paper in the same way. To colour steep each sheet for about 7 mins. in one of the following, and then hang up to dry: Copper chlorate (blue), strontium chlorate (crimson), barium chlorate (green), or potassium nitrate (violet). To light, roll one of these sheets of paper into a ball, light it, and throw it into the air immediately. It is not safe for the amateur to keep much of this paper ready-made in a pile.

Paste: Mix 6 oz. flour and a teaspoonful of powdered alum together, and then add 2 pts. cold soft water gradually, and stir all the time, so that the mixture is made absolutely smooth. Then

boil at a gentle heat, stirring all the time, till a stiff paste is formed. If desired the paste may be thinned by the addition of warm soft water.

Pin Wheels: Cut 17 lb. double-crown white paper in two down the fold, and then each half sheet into four, thus making eight pieces about 1 ft. 8 in. long. The former should be made from No. 6 or 7 B.W.G. brass wire, about 2 ft. 4 in. long. This former should be made slightly larger or bell-mouthed at one end. This may be accomplished by winding thread round it at that end, and increasing the number of lappings as the end is reached, and then giving all a coating of sealing-wax varnish. [*See* CEMENT (GLASS: *Sealing-wax*)] The paper should be pasted very lightly along one edge, and placed on a blotting-pad with the pasted edge upwards and farthest away from the operator. Place the former nearly half-way across the paper, and parallel to the pasted edge; lift up the nearest edge, fold it over the former, and then, starting from the middle, run the fingers along the paper and tuck it well under the former. Just before the ends are reached, commence rolling with the thumbs, and without any stop or jerk continue rolling till the pasted edge secures and fastens all together. If the paper be at all creased, throw it away, and commence again with a fresh sheet. The tube or pipe will of course be larger in diameter at one end than the other, due to the former being bell-mouthed. The funnel should be made of brass with the spout tapering so as to fit tightly into ⅜ in. of the bell-mouthed end of the pipe. The rammer is best made from No. 7 or 8 B.W.G. steel wire about 2 ft. 4 in. long, and it should be lightly notched across, so that it appears as though a coarse thread had been cut on it. The paper tube or pipe should be nipped on to the funnel during the process of filling, either in a spring vice or by a rubber ring. If a very large pin wheel be desired, the tail of one tube can be fitted into the bell-mouth of another, and thus a tube nearly 3 ft. 6 in. long obtained. In this case the proportion of meal powder in the compositions given later should be increased 10 per cent. A pin wheel, however, made from one pipe is usually considered the most satisfactory. To fill, turn over ¼ in. of the small end, fit on the funnel, pass the rammer down to the bottom of the pipe, half-fill the funnel with composition, and fill the pipe by lifting the rammer and giving short, quick and light blows. If the rammer be lifted too high, the pipe will very likely become choked. Continue the filling till the end of the funnel spout is reached. This can be felt by pressing the pipe lightly between the thumb and fingers whilst the rammer is being moved. Then remove the funnel and twist up the bell-mouthed end. The rammer should be left in the funnel ready to fill the next tube. Dip coarse calico into water; wring it out as dry as possible, and wrap up each filled wheel pipe in it, so that each pipe is entirely surrounded with damp cloth, and leave for about an hour in a cool place. Then take out a pipe and roll the bottom 2 in. between the thumb and fingers, and then press it out tapering to a wedge with a paper-knife. Place a wooden disc about 1 to 1½ in. diameter on a tile or piece of glass for a centre, and commence wrapping the tube round it in a spiral, commencing with the wedge-shaped end, and ending with the bell-mouthed end. When the end is reached, fix it down with sealing-wax, and then paste two bands of paper across the wheel at right angles to each

other to fix all the convolutions in place. Compositions for pin wheels: (1) Meal powder 4 parts, nitre 2 parts, sulphur 1 part. (2) Meal powder 4 parts, nitre 2 parts, sulphur 2 parts.

Quick Match: Dissolve ½ oz. gum-arabic in 7 oz. water, and then add meal powder till as a paste. Hang up lengths of lamp cotton, take the paste in the palm of the hand, and draw the cotton through slowly and under slight pressure. The cotton should be kept as round as possible. Leave the cotton hanging up till perfectly dry, and then cut it up into suitable lengths.

Serpent's Eggs: Mix 10 parts, powdered yellow prussiate of potash, 10 part flowers of sulphur, and 1 part potassium carbonate, and fill a black-lead crucible three parts full. Place the crucible over a very hot coke or blacksmith's fire, and cover it with a piece of fire-brick. When the mixture is melted, stir it with a piece of iron wire, and then pour it out on to an iron plate. When cold break it up into small pieces, and make a saturated solution of it in water. Make a saturated solution of mercuric nitrate in water, and then add a little sulpho-cyanide solution gradually. This will make a dense precipitate, and it should then be left to settle. Then add a little more sulpho-cyanide solution, and allow the precipitate to settle again, and so on till no more precipitate is formed. Filter, and then dry the precipitate in a water bath till as a paste, which should then be formed into small balls about as big as a pea. It should be remembered that both these solutions are very poisonous, the fumes given off during combustion being also poisonous.

Squib: Divide 70 lb. imperial brown paper (29½ in. × 22¾ in.) into 15 parts, each part being 7½ × 6 in. Divide 16 lb. demy white into 16 pieces. One piece of white and one piece of brown paper will be required for each squib. If a quantity is to be made, take about 30 sheets of white paper and lay them down evenly one on the top of the other. Rub gently in the centre of them with the knuckle of the first finger, when each sheet will slightly slide on the sheet below it. The sheets must be kept even sideways by taking them up and levelling the edges on the board, and then again rubbing with the knuckle till the sheets are a suitable distance apart lengthways. To paste, begin at the bottom and draw the brush upwards over the edges, so that each sheet will have a narrow strip pasted along one edge. Make a former of brass wire ¼ in. diameter × 1 ft. long. Lay one of the brown strips of paper down on a blotting-pad with one of the edges 6 in. long nearest to the operator. Place the former on the top and square across the strip about 2 in. from the edge. Lift up the edge nearest to the operator, and bend it over the former; press it well under the former on the farther side with the tips of the fingers and roll. When about ¾ in. of the brown paper is left unrolled, slip in one of the white sheets of paper into the crack, the pasted side upwards and away from the partly formed tube, and then continue the rolling. When the pasted edge is reached, it will stick on to the tube and fix all. The white paper will not extend to one end of the tube, for this part is left for dubbing in. Leave the cases to dry for a day or so, and they will then be ready for choking. To do this a choking machine, described earlier and illustrated in Fig. 1, should be used. Insert a piece of wire ⅛ in. diameter in the end of the case which is covered with white paper. Place this end in the groove in the

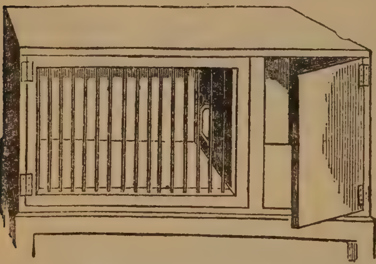
lower jaw of the choking machine, and bring down the upper jaw. Continue chopping and turning round the case a little between each chop, till the case is contracted or choked to $\frac{1}{8}$ in. internal diameter; then remove the piece of wire. Tie the choked end with thread making a clove hitch. [*See* KNOT (CLOVE HITCH)] Make a nipple (Fig. 4) of brass wire $\frac{1}{4}$ in. diameter, and file it down so that only $\frac{1}{8}$ in. projects beyond the base. Fit the choked end of the case over the nipple, and insert a funnel into the other end. The spout of the funnel should be tapered so that only about $\frac{1}{8}$ in. enters, but this should be enough to hold it firmly there. A brass rammer 1 ft. long × $\frac{1}{4}$ in. diameter must be made as described before, and illustrated in Figs. 2 and 3. The rammer should be inserted through the spout till the bottom rests on the nipple, and the funnel should then be three-quarters filled with one of the following compositions: (1) Meal powder 10 parts, wood charcoal 2 parts, sulphur 2 parts, nitre 3 parts. (2) Meal powder 16 parts, wood charcoal 3 parts, sulphur 4 parts, nitre 6 parts. Pass all the ingredients separately through a 30 or 40 mesh sieve and then mix together, and pass them all through a 20 mesh sieve three or four times. The funnel being partly filled, lift up the rammer, and give numerous short and sharp jerky blows till the case is three-quarters full. Then remove the rammer and funnel, invert the squib over the loose powder, and tap it lightly to remove all loose powder from the surface of the unfilled portion of the tube. Repeat the filling on as many cases as required, and then bunch them together, the choked ends lowest, and sift "F" or treble strong gunpowder over them till they are filled level with the white paper. Make a small pellet of soft paper for each squib, and press it down on the top of the powder. Then place the end in the choking machine, and dub over the brown paper end till the case is completely closed. Mix 6 parts meal powder, 2 parts nitre and 1 part sulphur, and then add water till as a very stiff paste. Press the choked end of each squib in this paste, and then twist a piece of touch-paper round the mouth, tie it in position with a clove hitch, and screw the end up to a point. Finally dip the dubbed-in end in dipping composition. [*See Dipping Composition*]

Star Lights: These fireworks are made precisely as blue candles [*see Candles*], the only difference being in the composition. Composition: 40 parts nitre, 7 parts lampblack and 12 parts sulphur. Mix these ingredients together fairly intimately, fill a sample light, and light it to see the effect. If a great deal of smoke is produced, and only a few sparks, the mixing is not complete. If, however, the mixture burn very fiercely, the ingredients have been over-mixed. The correct amount of mixing should produce numerous and large starry sparks with very little smoke.

Touch-paper. Dissolve 1 oz. nitre in about 8 fluid oz. water. Lay out a sheet of 14 lb. blue double-crown paper, and paint one side of it with the nitre solution, applying it with a brush. Lift up the paper, hang it up to dry, and then cut it up into convenient sizes.

RABBIT HUTCH. Make the hutch 3 ft. long × 1 ft. 6 in. wide × 1 ft. 3 in. high. There should be a partition for a bed-place 1 ft. from one end, leaving a run 2 ft. long from the partition to the other end. Make the sides, top and floor of $\frac{3}{4}$ in. deal; the back and partition of $\frac{1}{2}$ in. deal. Make the large door frame of 1 in. deal, $1\frac{1}{2}$ in. wide. It is best to make a mortise and tenon joint at the corners, but they will

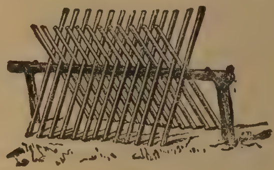
hold if mitred and screwed. Place galvanised iron wires ½ in. apart, boring the holes with a gimlet in the large door, as shown in the illustration; or galvanised wire netting may be fixed on the inside with staples. Now hang the door on hinges, and place a hook on the other end to hold it closed. Cut



the divisional piece between the two doors from 1-in. deal, 2 in. wide, and let it into the top and floor so that it lies flush. Make the small door to the bed-place of 1 in. deal. Fit it into the opening, and then hang on its hinges. Fix a hook on to the other end, with the eye on the divisional piece between the two doors.

RACK: CATTLE FEEDING. Make from 2-in. boards about 4 to 5 ft. wide × 10 to 12 ft. long 2 × ft. deep. Place 4 in. × 4 in. scantlings at the corners, and in the centre of the ends, running up 12 to 15 in. above the top of the rack. To the middle scantlings nail on a centre partition lengthways, so that the food may be piled, and the cattle can feed from both sides. If the end boards do not reach down to the bottom, and the sides are curved at the ends like sled runners, the racks may be easily shifted. If boards be not obtainable, make the rack of rough poles. Cut the corner and centre posts 3 ft. long, and pin three horizontal rails on to each side. 1 ft. from the ground nail cross-pieces or cleats across the end posts, and then pin on horizontal poles for the bottom. [*See also* RACK (SHEEP: *Cross Slat*)]

RACK: SHEEP. *Cross Slat:* Hang a pole in two forks, and drive sticks crosswise into the



ground, as shown in the illustration. This rack is most suitable in dry or frosty weather.

Flaring: Cut a board from a 2-in. deal plank 8 in. wide by about 12 ft. long. Drill holes with a 1-in. bit 2½ in apart, about 2 in. from the sides and ends. Drill the holes along the sides, so that when 1-in. sticks, which are 18 in. long, are driven in, they will be 2 ft. apart from side to side at the top. Fit light scantling all round the top by boring holes corresponding to those in the bottom piece, mitre the corners, and screw on a triangular piece at each corner to strengthen. Put pieces of 1-in. board across the middle and ends for supports. Set the rack upon five legs, one at each corner and one in the middle. Across the bottom of the legs nail boards long enough to prevent the rack upsetting.

Portable: Saw two boards 12 ft. long × 12 in. wide; two boards 12 ft. long × 6 in. wide; two boards 2 ft. 6 in. long × 6 in. wide; two boards 2 ft. 6 in. long × 12 in. wide; six posts 2 ft. 6 in. long × 3 in. × 3 in. Set four posts for the corners and two in the middle. Nail the two 12-in. boards to the posts 2 in. from the bottom; 10 in. above these nail the two boards 6 in. wide. The 10 in. gap is for the

sheep to put their heads through. Board the ends up with the four boards 2 ft. 6 in. long in the same way as the sides; and if it be desired to have a bottom to the rack, nail cleats across the end and middle posts about 3 in. from the bottom, and fit a long plank to rest on them. Drop boards, hung on leather hinges, may be fitted on the outside, covering the 10 in. gap. These boards usually are held back by straps, but when it is desired to stop the sheep feeding, they may be dropped.

Shed: Drive in stakes 20 in. from the sill inside, and 6 ft. apart. Nail on boards about 1 ft. wide at the bottom, and others narrower 8 or 10 in. above these. Uprights may be nailed up and down once in 10 in. if desired, so that each sheep may have a stall. Cut away the weather or match-boarding from the sill outside 18 or 20 in., starting 18 or 20 in. above the ground. Nail a girth on the inside just before the opening to stay the siding. Hang drop boards all round the outside on leather straps, which may be opened or closed, as in the portable rack. In warm weather the drop boards should be left open for ventilation.

RAFT. (1) The smallest serviceable raft should be constructed on two logs each 10 ft. long by about 12 in. diameter. Sharpen the ends of the logs, and then nail on cross pieces about once in 12 in., keeping the logs 4 ft. apart. The floor may now be laid on of old light boards. (2) Select four thoroughly watertight casks; bung them up, and build the framework on them, placing one barrel at each corner. It is best to bind the barrels on, so that a sudden jar does not break them off.

RAKE: GARDEN. For the head use a piece of 1½ in. square ash, 2 ft. long. Bore a ¾ in. hole in the centre for the handle, and bore suitable sized holes every 2 in. to drive twelve penny nails flatwise with the grain. When driving in the nails the head should be held in a vice, and the nails should be a good driving fit. To brace, drive a ¾-in. screw into each end of the head half-way in, and another in the handle 10 in. up from the head. Twist a piece of wire tightly round the screw in one end of the head, then round the screw in the handle, and lastly round the screw in the other end of the head. Draw tight and fasten by winding. Wood braces may be screwed on, but this makes the rake heavier to work with.

RAKE: MANURE. (1) Make the head of a piece of hard wood, 4 in. thick × 15 to 18 in. deep. Set a pole into the centre of the broad side, and brace it firmly in position. Bolt an old mill saw plate on to the front side of the head, so that it sets flush or a little below the bottom edge. If the manure be hard, weights must be put on the top edge of the head. This spreader, when hitched on to a horse and heavily weighted, will also level a meadow, shearing off the lumps and filling up the hollows. (2) A very stiff and heavy broom may be made after the pattern of an extremely heavy hay rake. The holes in the head should be plugged with bristles instead of wooden teeth, and they should be stiff enough to allow a man to stand on the back of the head without crushing them. The broom should then be weighted and drawn over the meadow.

RAZOR: TO SHARPEN. Use the best Turkish stone and lubricate with glycerine and alcohol. The back of the razor should touch the hone as well as the edge. Do not press hard, and give a circular motion to the razor. [*See also* OIL-STONE]

RAZOR: HOW TO STROP. The strop should not be of very soft leather. Prepared canvas is good, if the razor be stropped a little on leather afterwards. The razor should be drawn from heel to point, and turned over on its back at the end of each stroke, to commence the next. If the razor be stropped too much the edge is dulled. To renew the sharpening qualities of the strop: (1) Rub it over lightly with clean tallow, and then put on the top candle snuffings or burnt cotton. (2) Rub the leather well with pewter, till the strop becomes black.

RAZOR STROP: TO CLEAN. Rub the strop with a dilute solution of ammonia water till it is clean.

REAMER. Grind the heel of an old triangular file to fit the bit stock, or fit it firmly into a handle; then grind all the three faces smooth. The end fitted into the handle or

stock should be softened [*see* ANNEALING (*Iron and Steel*)], but the cutting edges should be left the same temper as the file was.

RELAX INSECTS: HOW TO. Half fill a basin with wet sand, and saturate it with water. Press bottle corks half-way down into the wet sand, and pin the insects on to them; then cover over with a tumbler or finger-glass. Leave for two to five days till relaxed, and then set the insects in the ordinary way. After being set for a week or so, remove the insects from the board, and place a drop of shellac varnish at the junction of each wing and the thorax on the under side; then set again on a board with a wide groove down the middle so that the varnish does not touch the board, and leave till the varnish has become hard.

RESIN: HOW TO SOFTEN. Melt the resin, and add tar till of the required consistency. By pouring a little of the melted mass in cold water the hardness of the mass when cold can be ascertained.

RIBBONS: HOW TO WASH. (1) Boil an old kid glove, which is as near as possible the colour of the ribbon, in water for a short time, and when the water is cool enough, take the glove out, and use it as a sponge on the ribbon, applying the water it has been boiled in. If the ribbon be very dirty, dip it into this weak dye, and draw it through the fingers a few times. (2) If the ribbons be dingy and greasy, rub the yolk of an egg or French chalk on them upon the wrong side, and let it dry; then lay the ribbons out on a cloth, and wash on both sides with a sponge, and press upon the wrong side. If they be very much soiled, use bran water; and add to the rinsing water muriate of tin, to set red; oil of vitriol, to set green, blue, maroon and bright yellow. (3) For larger silk ribbons and cravats, rub the dust from the surface, and apply a mixture of equal quantities of strong tea and vinegar freely with a flannel; smooth out the silk, and iron. If the creases be very bad, dip the ribbons in naphtha or gasoline, and hang them up to dry; then lay a piece of paper over them, and iron them with an iron just hotter than can be touched with the naked hand. To starch ribbons: (1) Dissolve a lump of gum-arabic the size of a filbert in ½ pt. water. (2) Dissolve two lumps sugar in a teacupful of water.

ROCK BOAT. Cut two logs 8 ft. long, having a bend or crook in them of about 20 degs., making 6

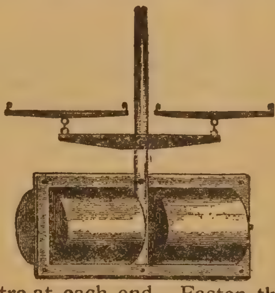
ft. body and 2 ft. crook. Select for preference oak or similar hard wood. Place these logs side by side, with the crooks in the air, about 2 ft. 6 in. to 3 ft. apart. Pin them together with cross pieces, using hard wood pins. Drive staples into the logs, or fit an iron rod through two mortise holes made in the logs, to attach the drawing chain to.

ROCK: HOW TO BURST. (1) The usual way is to crack the boulder by heat and then remove the pieces. If the rock be bedded in the ground, remove the dirt about the sides, and make a fire all round the base. If the rock flakes away at first on the top, the pieces should be removed as they crack off. (2) Drill a vertical hole down the centre of the rock. Pour in molten lead till about half full. Fit a steel mandril to the hole, so that it will rest firmly on the lead, and a portion of it project beyond the hole. Hit the mandril heavy blows with a sledge till the rock breaks. [*See also* BLAST BOULDERS (HOW TO)]

ROCK: HOW TO BURY. Most boulders can be removed by digging pits on one side large enough for the rock to be buried in. The rock should be covered with at least 1 ft. earth. Care should be taken to dig the pit large and deep enough, a second trial being rarely possible.

ROCKERY. Select a spot which is shaded by a tree at noon. Mark off a circle about 3 ft. diameter. Place a large rock in the centre, and space pillar-shaped rocks equally round the circumference. Throw a wheel-barrowful of soil into the circle, and press it well down between the rocks, making the pillars incline slightly inwards. Place long narrow rocks from the top of the pillars to the centre rock, and from pillar to pillar, then fill up with soil and make another storey, only smaller, and so on till about 5 ft. high. It is convenient to plant the mosses, stone-crops, flowers, etc., during the construction. The top may be left flat to stand a pot of flowers on. The rockery may be made of common lime stone, mussel shells, old bottles, etc.

ROLLER: LOG. Saw off a log about 2 to 2½ ft. diameter × 3 ft. 6 in. long, and bore a 2½ in. hole through the centre. Cut two wooden blocks 4 in. thick × 5 in. wide × 10 to 12 in. long; let them into the log 2½ in., so that they may project 1½ in.; bore holes in these the size of the rod used for the roller to turn on, say 1½ in. diameter, and corresponding with the centre of the hole bored through the log. Dress off the projecting part of the blocks with the exception of 5 in. in the middle, so that a square boss 5 in. × 5 in. projects 1½ in. from the



centre at each end. Fasten them firmly down with screws. Run a 1½ in. iron rod through the log, and support each projecting end of the rod on V blocks. Turn the log round, and resting a pencil near the edge describe a circle on the end. Describe a circle on the other end in the same way and of the same diameter. Trim off the wood with an adze till as cylindrical as possible, and finish with a plane. With the use of a straight-edge and by holding a pencil near the face, so that any part slightly higher than the rest will be marked

when the log is rotated, a perfect cylinder may be made. Withdraw the rod, bore out the 1½-in. holes to 1¾-in., and drive a 4-in. length of 1½-in. gas barrel in each end for a bearing; a ⅛-in. hole may be bored through the boss and through the barrel on each end for oil holes. The bar should work easily in the gas barrel. Make another roller exactly the same. Make the frame of 4 in. × 4 in. wood to suit the size of the rollers. The 1½-in. iron spindle should be rigidly attached to the side pieces by clips made from $\frac{3}{16}$ in. plate.

ROLLER: PLANK. Cut off sixteen boards from 2-in. deal 20 in. broad × 3 ft. 4 in. long. Place two boards side by side on the top of two boards, which are also side by side, but lying at right angles to the top two boards; and spike all four boards together. A solid block will then be formed 3 ft. 4 in. × 3 ft. 4 in. × 4 in. thick. Make three more of these with the twelve remaining boards. Strike a circle 3 ft. 4 in. diameter on each of these blocks, and saw and shape up to the line. Bore a 1¾-in. hole through the centre of each, and drive in 1½ in. gas barrel into two of them. [*See* ROLLER (LOG)] Place them 1 ft. apart, the two outside ones being those with the gas barrel in, so that there is 4 ft. 4 in. between the outside faces of the two outside circular blocks. Now cover with 2½ in. × 3 in. staves 4 ft. long, nailing them horizontally on to each block, and bevelling the edges, so that they fit well all over. The outside should be planed to take the ridges off. Run a 1½-in. iron rod, 5 ft. 4 in. long, through the centre, place 2 in. loose wooden washers on to each projecting end of the rod, so that the roller cannot rub against the frame. Make the frame from 4 in. × 4 in. wood, as shown in the illustration for ROLLER (LOG).

ROLLER: SUBSTITUTE FOR FIELD. Cut five planks from 2-in. oak, or some other hard wood, 12 in. wide × 8 ft. long, and lay them flat with the edges just overlapping. Cut two batons from 4 in. × 4 in. oak, and bolt firmly to the

planks near each edge. Pass a chain through the batons on each side about the second plank. It should be drawn across the field square, not diagonally, and may be weighted with stones, as desired.

ROOFING: FELT. The roof should have a slope of not more than 1 in 1½, and not less than 1 in 5. Use felt weighing about 6 to 7 oz. per sq. ft., and about $\frac{3}{16}$ in. thick. Lap the joints 2 in., and hold in place with ⅞ in. clout nails, weighing 2¼ lb. per 1,000, at 2 in. pitch. Dip the nails in oil [*see* NAIL RUSTING (TO PREVENT)], before driving them in; or better still, use copper nails. Boil 5 lb. whiting in 1 gal. hot tar, and apply it hot to the boards and felt before nailing it in place. Mix 6 lb. dry powdered chalk or dead lime in 2 gals. coal tar, and apply two coats to the felt while it is hot; then sprinkle sand over immediately. The tarring should be renewed at least every other year. Canvas dressed with Stockholm tar and pitch is quite as durable as felt.

ROOFING: SHINGLE. The best material is white pine of large growth, then oak, ash, cedar and chestnut. The timber should be fine grained and well seasoned. Saw the trunk square across in lengths of about 16 in., and place them top downwards to season. Place the block upon the butt end, and mark off with chalk on the top end, as shown in Fig. 2. Remove all bark, and then split up the log

with a frow and mallet into eight sections. Sub-divide these into smaller sections about 1½ in. thick, and remove the heart as marked off in Fig. 1. On the top of a log cut a

FIG. 1.

FIG. 2.

slot right across about 1½ in. thick × 3 in. deep. Fit the section in this slot and then split the section into four pieces, each piece being about ⅜ in. thick, and each piece forming a shingle. Start the frow with a blow from a mallet, and then split off the shingle with hand pressure only. When pressing upon the frow handle, watch the separating fibre; if the split be running to one side, invert the piece, and the course of the split will be changed when pressure is applied to the frow handle again. If the shingles are to be stored they should be bunched as shown in Fig. 3. The

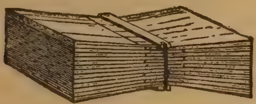


FIG. 3.

frow may be cheaply made from a piece of an old wheel tire. It should be bent round to form the hole for the shaft to be fixed in, and the two thicknesses in the blade

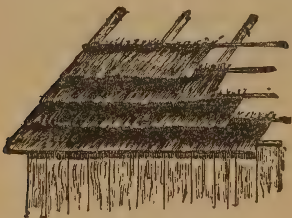
FROW.

welded together. The frow should then be filed up and sharpened and case-hardened. The mallet may be made from a section of a small tree. It should be well seasoned, and made of tough, dry wood. Each shingle should be nailed on with two copper nails, or preferably oak pins. Lay them overlapping, so that about 4½ in. are exposed to the weather. (1) Paint the shingles on both sides with best paint before nailing them on. As each course is nailed on, give a good second coat on the top, and when all is dry give a third coat. The painting should be repeated at least once every seven years. (2) Dip the shingles in a boiling mixture of gas tar and resin. When all the shingles are nailed on the roof, give another good coating of the tar. The roof should be repainted with the pitch once every four or five years. (3) Dress the shingles in thin whitewash made with brine instead of pure water. As each course is laid apply another coat, and a third coat when the roof is complete. (4) Warm 1 barrel lye of wood ashes, 5 lb. white vitriol, 5 lb. alum, and as much salt as can be dissolved in a large tub. Immerse the shingles, and stir them up with a fork. Leave them to dry, and then lay the shingles as usual.

ROOFING: TAR. (1) Melt 4 parts tar in an iron pot over a slow fire, and then sift in 1 part air-slaked lime and 1 part hydraulic cement. Thoroughly mix, and apply while warm. Apply a second coat when the first is dry, and then sift on sand immediately. (2) If the roof be nearly flat, first cover the boards with roofing paper and road dust, then pour raw coal tar upon sections of the roof, spreading it evenly to the depth of ½ in. After six weeks repeat the process, and then a third time six weeks later.

ROOFING: THATCH. Clean wheat or rye straw should be used, which has not passed through a threshing machine; barley and oat straw is not so good. The straw will weigh about 7 cwt. per 100 sq. ft. of roof if laid on 9 in. thick. In fenny districts flags and rushes may

be substituted for straw. The rushes should be cut in the autumn, dried in the sun, and stacked. Heath, furze, etc., may be used as a finishing coat only to the straw. The rafters may be pitched 18 to 24 in. apart, the size varying with the size of the roof and the distance between supports, but it must be remembered that thatch weighs far more when old and wet, the rafters also getting weaker. Use scantlings about 2 in. × 4 in. Make the laths from fir or larch about 1½ in. diameter, and shave them down parallel with a spoke-shave. Use light copper wire for best, well-tarred hemp twine for cheaper work. Hazel pegs may be driven through the thatch catching on to



longitudinal laths, called runners, and bound in place; this keeps the thatch in place during a high wind. The straw should be thoroughly dampened before being used; then pack it into split hazel rods at the butt 6 to 9 in. from the end. A second tie should be made 6 in. below the first, and the split ends of the rods secured with wire. Long steel eyeletted blades are used for needles. Comb the thatch with an ordinary hay-making rake as the work proceeds. Then trim each course with a pair of shears. These bundles are fixed in place with forks driven down through the thatch, and secured by an assistant on the inside. The thatch should be combed again before the runners are fixed on. The eaves should project 18 in. to 2 ft. from the wall face, and should be trimmed at right angles to the vertical. When the thatch butts against chimneys, or any excrescence, it should be laid on much thicker, and a heavy oversailing course of slate or bricks, which project at least 3 in. from the chimney, laid over.

ROOT CUTTER. Make a three-sided box from 1¼-in. deal, 12 to 15 in. each way. Saw one end square, and to that end attach a knife, which may be made from a piece of an old scythe, by drilling a hole in one end and pivoting it on a screw driven

into the wood; the cutting edge should be long enough to cross the box, and be hung even with the top edge of the bottom board. Attach a handle to the other end of the knife, and let it work up and down in a wooden or iron guide.

RUBBER JOINTS: CHALK FOR. When making rubber or insertion joints, always powder a little chalk over the rubber. The rubber can then be separated afterwards, and does not stick to the metal.

RUG: CHENILLE. Cut scraps of coloured woollens, silks and cottons into small squares much the same size; thread them on strong twine, and then with shears trim off so as to make the roll as round as possible. Take a piece of heavy carpeting for a centre, and sew on the edge a strip of the chenille; then on that another strip, and so on, just as braided mats are made.

RUG: CLOTH. Cut pieces of cloth 4 in. square; double once diagonally, and gather to form a leaf. Sew on hemp carpet or stiff

canvas. Begin at the edge and sew all round, concealing the raw edges in the centre with a small cross or diamond of tufted yarn or wool.

RUG: SCRAP. Draw a design in the centre, and a border round the edge of a piece of hemp sacking or canvas, which is to be the foundation for the rug. Sew the canvas tightly into a frame; make a hook like a crochet needle from a piece of wire, and file the end into the required shape. Cut the scraps of cloth in breadths of about ½ in., or broader if the fabric be fine. Pass the hook down through the tightly-stretched canvas, insert a loop of fabric on the hook, and then draw the hook back again, thus bringing the fabric through the canvas, and let it project about ¾ in.; leave about three threads space, and then hook another piece of fabric through from the other side, and so on, using the different coloured fabrics to shade the design. Work the designs first, and then draw in the background of some dark-coloured fabric. When complete, shear off the whole surface evenly, but not too close.

RUG: WOVEN. Cut strips of cloth the required length of the mat and 1 in. wide. Lay them side by side and touching on a smooth board, and nail the ends down. Take some more strips, and weave them in, one at a time, until the whole forms a smooth, close web. Fasten all in place by sewing round the edges with strong thread. Remove the tacks, trim off, and sew on a fringed or pinked border. [*See also* CARPETS (RAG)]

RUST: TO PREVENT. Smear all over with one of the following: (1) For light work (*a*) Vaseline, thick salad or sperm oil. (*b*) A mixture of 1 part fat oil varnish and 4 parts turpentine. (*c*) A mixture of 1 part beeswax and 2 parts benzine. (*d*) A mixture of 1 part beeswax and 1 part paraffin. (2) For medium work, apply a mixture of mutton tallow (free from salt) and white lead, while hot. (3) for heavy work, apply a mixture of 5 parts tallow and 1 part rotten stone. (4) To prevent nails and screws from rusting *see* NAIL RUSTING (TO PREVENT).

RUST: TO REMOVE. (1) If the surface has no sharp corners, polish all over with fine emery and sperm oil. (2) Immerse the article in kerosene oil for a short time, and then polish with cork. (3) In cases where the iron contains hollows difficult of access, it may be coupled electrically with a rod of zinc, and immersed in a weak solution of acid. In a few hours the iron will be clean; it should then be rinsed in pure water, and dried in boxwood sawdust. (4) When iron exposed to heat has rusted, apply a mixture of tripoli with half its weight of sulphur well ground together on a piece of soft leather. (5) For table-knives, etc., cover with sweet oil, and leave for 24 hrs. Then polish with leather and emery powder, powdered pumice-stone or pulverised unslaked lime. (6) For very heavy articles, brush them over with a dilute solution of sulphuric acid, and leave it on till it evaporates. Then wash, and where the worst places are, polish with rotten stone and then with emery powder. Thoroughly scour with warm water and then dry. (7) Immerse the article in a solution of ½ oz. potassium cyanide in a wineglassful of water. Then take it out, and brush it with paste made of potassium cyanide, Castile soap, whiting and water.

SAND-PAPER. Rub the finger over the surface to see if the sand, glass or emery be well secured. Tear the paper to test

the strength, which should be tough, not brittle.

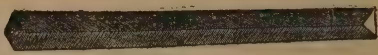
SAW: GUIDE FOR. In nearly all cases it is best to draw lines with a square to saw to, not judging by the eye. To saw rough logs, etc., rip a hoop off a barrel of suitable size, remove the bark from the log, pin the hoop round the log, and then saw down the side of the hoop.

SAW HANDLE. For a cross-cut saw, work out the handle like an inverted *V*. Rivet one side of the handle to the saw perpendicularly, and let the other side of the handle project at the required angle.

SAW: KINKED. If a hand-saw has become kinked or warped, it should be rolled between heavy rollers to straighten it. In most cases, however, it may be straightened by laying the blade of the saw flat on an anvil or chipping block and striking a series of blows down the centre of the blade with a round-faced or engineer's hammer. Repeat the blows till the kink is taken out, always beginning at one end and working down to the other.

SAW: TO SELECT. Pass the blade between the thumb and fore-finger, or lay the blade on a flat surface and pass the palm of the hand quickly over it, to feel if the blade be of uniform thickness. By this means the slightest unevenness can be detected. Hold the handle so that the side of the blade is upwards, and give it a sharp side-swinging motion. The motion should be light, even and quick, not uneven or dull. The blade should be of the colour of clear air seen at a distance. A glass colour is too hard, a lead colour too soft.

SAW SET. Break a piece out of the middle of an old triangular file about 4 in. long. Soften it [*see* ANNEALING (*Iron and Steel*)], and then file the rough off the edges and the ends square. Temper one



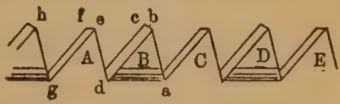
end yellow, keeping the other end soft. [*See* TEMPERING]

SAW: HOW TO SET AND FILE. *Circular:* Put the saw in motion, and hold a dead smooth flat file against the teeth, until they are all of equal length. Next hold a pen at the base of the deepest tooth; and, as the wheel revolves, a circle will be drawn upon the saw-plate. Remove the saw, screw it between two circular boards in a vice, and file down to the guide line, keeping the angle of the teeth the same as they were when new. Great care should be exercised when filing or marking the saw while it is revolving, as numerous accidents take place from carelessness.

Cross-cut: To joint, dress out two $\frac{3}{4}$-in. curved boards as long as the cutting edge of the saw, so that they conform to the curve of this edge, *i.e.*, the general rounding plane of the teeth. Place the saw between these two boards, so that the points of the shortest teeth are barely even with the boards. Hold the boards in place with clamps, or four small bolts passing between the teeth. Now with a smooth file work off all the points of the teeth even with the shortest ones, by running the file down lengthwise with the saw. Make a standard gauge or wedge to give an absolutely equal set to all the teeth. File a piece of an old thick saw square, and then bevel one edge off at the required angle till it is like a very broad and short chisel. Lay the wedge on a flat surface, and hit every other tooth with a hammer and saw-set till it is brought over flat on the bevel. The saw is now turned over on its other side, and the teeth left out

in the first operation bent over on to the bevel in the opposite direction. It was said for simplicity of explanation, that one tooth was bent outwards in one direction, the next in the opposite direction, and so on all the way along. It is best, however, to leave every fourth, fifth or sixth tooth straight to rake out the chips. These straight teeth are called drag teeth, and when the saw is set they should be filed down, so that they are $\frac{1}{50}$ in. below the cutting teeth. The same two boards used for jointing may be used for filing, by removing the clamps or bolts, and lowering them down, so that the top edge of the boards is just level with the bottom of the lowest teeth. Do not file the first side quite up to the points, but turn the saw round and file from the other side, and then turn back and finish on the first side. After the saw is filed, round off the point of the first tooth to prevent it catching and sticking in the kerf.

Hand: Lay the saw flat on a piece of hard wood, and bend every other tooth outwards with a hammer and saw-set. Each tooth should be bent outwards the same amount. Now turn the saw over, and set the teeth missed out in the first operation in the opposite direction. Bend the teeth outwards half the thickness of the blade, so that when sighting along the teeth the inside edge of all the teeth look in a straight line. If the saw does not work evenly, and seems to catch and jump, sight along the teeth, and if there be any irregularity in the set at any point, knock the teeth flat, and then reset. The catching and jumping may also be due to the teeth being filed too hooking. A heavy hand-saw should always be kept crowning about $\frac{1}{8}$ in. in the centre. This can be seen by sighting along the teeth, and seeing if the teeth gradually rise towards the centre, and fall away again towards the ends. The illustration represents a part of a hand-saw in the vice ready for



filing. The teeth (B) and (D) are supposed to be bent towards the operator, the teeth (A), (C) and (E) away from the operator. A smooth, flat file is first run along the tops of the teeth till no one tooth projects farther than another. The three-cornered file is now placed between the teeth (B) and (C); the cutting edge of the tooth B, *i.e.* (*ab*), is filed so that it is sharp so as to make (*dbc*) about 80°, the edge (*ab*) being almost vertical, the back edge of the tooth (C) being left to take care of itself. Then file in the same way between the teeth (D) and (E), and so on all along. Then turn the saw round in the vice, and file between (A) and (B), then between (C) and (D), and so on, the angle (*gfe*) being made about 80° as before. The angles (*hge*), (*edb*), will be about 60°. Not all the filing should be done at once; first file lightly every alternate tooth from one side, as explained, then turn the saw round, and file the teeth left out from the opposite side; then turn the saw round again, and finish up the first set of teeth, making all the points of these teeth sharp, but none of them lower than the rest; then turn the saw round a third time, and finish up for the second set of teeth, Finally run a smooth, flat file *very* lightly along the top of the teeth, and then along the sides.

SAW: TO TIGHTEN TENON. Old saws are often improved by hitting the end of the back bar with a hammer.

SCAFFOLDING: PORTABLE. Cut two pieces of 4-in. × 4-in. deal 3 ft. long, halve them and bolt them together at right angles. Brace them firmly with two braces, one on each side, made from 1 in. board, as shown in the illustration. Cut a pole of 4-in. × 4-in. deal, and cut one end to fit into the angle already mentioned. It will be seen that the height of

the scaffolding depends merely on the length of the pole, and it can be raised and lowered within limits, by placing the foot of this pole nearer or farther from the building. Make more of these frames and poles and then rest boards across the frames. If a long length of scaffolding be required it will be well to have a frame once in every 8 ft., and to stay the outside frames with rope or wire.

SCALE: BOILER. Scale is deposited in pipes and boilers from the water. To prevent this the water should be artificially softened by adding chemicals. The chemicals to be added depend on the water used, and a sample of the water should be sent to the manufacturer from whom it is proposed to buy the chemicals. When scale is once formed, it is best to remove it mechanically, but paraffin or refined coal oil may be used. Oils should not be used in a boiler which supplies steam to an engine.

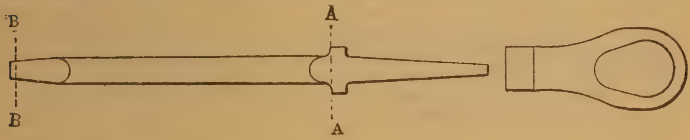
SCENT. Cover flower petals in a saucer or flat dish with rain water, and set them in the sun. After a few days a film will be seen floating on the top; skim this off, and put it in small bottles, which should be left open for the water to evaporate; then cork up.

SCORCHED GOODS: HOW TO WASH. Boil in a mixture of 1 part soap and 1 teacupful turpentine in 1 gal. milk.

SCREEN. To make the framework of the screen *see* CLOTHES-HORSE. The proportions should be kept much the same, but the size may be altered as desired. It will be found best, however, to make the bottom bar on each panel as near the ground as possible. The casters may be left out, and the bottom bar on each panel made of 1 in. wood for the screen to stand on. Cover the frame with coarse muslin, and nail it as tightly as possible all round the edges. The muslin may be covered with 2-in. strips of two different coloured materials woven together checker board fashion. Tack strips on edge to edge one way, and then weave in the cross strips tightly. Other coverings are scraps, embroidered silk, black cloth with gilt thread sown down in japanese designs, etc. Tack on heavy braiding round all the edges with fancy brass tacks, and nail on brass corner pieces.

SCREW-DRIVER. Forge an old ⅜-in. square or round file somewhat to the shape shown in the illustration, and then soften it. [*See* ANNEALING (*Iron and Steel*)] Select an ash handle and drive on a strong brass ferrule at the bottom. Saw a slot in the brass and wood, so that the shoulder at the top end of the driver will fit up snugly, as shown in the illustra-

tion. Heat the tang end of the driver red hot, and press it square into the handle. Repeat till the handle is nearly home, that is, when the bottom of the handle is about ½ to ⅜ in. above (AA). Now temper the bottom end of the driver dark blue [*see* TEMPERING], so that a file will just cling, and not skid. Drive the handle down firmly till the bottom of the slot in the handle reaches (AA). File off any projections of the shoulder round the ferrule, and cut flats on



the handle to give a good grip. A few light scratches are sometimes made with a file across (BB). This will prevent the driver from riding over the screw, but it also tends to weaken it. For the same reason the flat is sometimes filed and ground out hollow instead of straight. The thickness at the end should depend on the work for which the driver is to be used, but $\frac{1}{32}$ in. should be a minimum. Long drivers are more powerful than short ones, and those made to fit into a brace the strongest of all.

SCREW-HEADS: HOW TO PLUG. Sink the head at least a ¼ in. below the surface, and insert a plug of the same wood as that in which the incision is made, and have the grain as near as possible the same, and running in the same direction. Fit the plug with bevelling sides so tight that when it is driven in solid it will not quite reach the head of the nail or screw. Apply glue to the sides of the plug before driving, plane off the surface, and sand-paper until smooth.

SCREW-HOLES: HOW TO PLUG. (1) Where the screw-hole has become too large, immerse a stick about half the size of the screw in thick glue and put it into the hole; then immerse the screw, and drive it home quickly. (2) Instead of using glue, insert the stick, and fill up the cavity with powdered resin; then drive the screw in, having first heated the screw sufficiently to melt all the resin.

SCREW: PICTURE. When it is desired to hang a picture on a lath and plaster wall, and there is not holding for a nail, bore out a hole slightly larger than the screw, fill the hole with plaster of Paris mixed with salt water. (1) Insert a screw by turning it in, do not press it in; finish by pressing the plaster well down with a knife. The work must be done quickly, for the plaster soon sets. (2) Bind copper wire round in the thread of the screw, so that it projects beyond the top of the screw thread. The wire will thus form a nut to the screw. Press the wire and the screw into the soft plaster, and work the plaster well down with a knife from the outside; then leave it to set. When set, the screw may be taken out, or screwed in as desired, the wire being held firmly in the plaster.

SCREW: HOW TO REMOVE. To remove, clean the cut in the screw head, use a sharp driver, and give strong jerky turns to the handle. If the screw does not start, hit the head with a small punch and hammer. and then use the driver as before, If the screw will not now turn,

hold a hot iron to the head until the screw has had time to become hot all the way down; then use the driver again.

SEED: TO FORCE. Soak good seeds in water for 24 hrs., then put them in a bag, and expose them to the sun all day. In the evening plant the seeds in a well-manured hot-bed, and keep them thoroughly watered with lukewarm water.

SEED ORNAMENTS. For the ornamentation of picture-frames and boxes, attach seeds of pumpkins, corns, melons, apples, coloured beans, etc., with varnish. Arrange them in geometrical patterns or designs, and then give a coat of good varnish over all. Nuts and pebbles may be used, but the pebbles should be fixed with cement. [*See* CEMENT (GLASS: *Diamond*)]

SHED: CATTLE. To protect cattle from storms and rain, a light shed should be run up in a corner of the field. Make a tight board fence 5 to 6 ft. high, and about 10 to 12 ft. away from this fence erect posts 8 ft. high. Nail boards up to the tops of the posts, which will run parallel to the fence. This will form the two sides, but the ends should be left quite open. Put thin boards on the top for the roof, and cover over with felt and tar [*see* ROOFING (FELT)]; or else nail fillets on the top and bottom of each crack, giving a coat of tar before and after nailing. These fillets should preferably be made bevelling both ways away from the crack. Double sheds may be made in a similar way, the posts being in the centre, and the roof sloping away on either side. The centre line of posts in this case should be very strong, for horned cattle will rub their heads against them.

SHED: CYCLE. To store two safety bicycles or one tricycle. Cut (A) and (B) 5 ft. × 3 in. × 2 in.; cut (C) and (D) 4 ft. × 3 in. × 2 in.; cut (E) and (G) 6 ft. 6 in. × 2 in. × 2 in.; cut (F), (H), (L) and (M) 4 ft. × 2 in. × 2 in.; cut (I) and (J) 7 ft. × 2 in. × 2 in. Fig. 2 shows the method of half jointing the four top corners, and Fig. 3 the method of joining at the corners of the floor. Make the legs 3 in. long, so that the floor is raised 5 in. above the earth. All the joints should be painted with white-lead paint before being put together, and then fixed together with hard wood pins. Make the floor form $\frac{3}{4}$ in. or $\frac{7}{8}$ in. match-boarding, the sides and roof from $\frac{5}{8}$ in. match-boarding; or the roof may be made from weather-boarding, with well fitting joints at the edges. Paint the tongues and

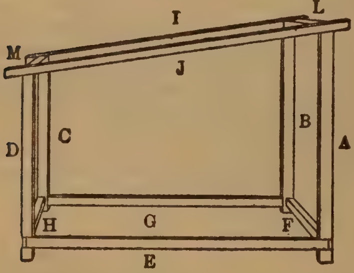


FIG. 1.

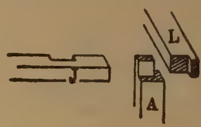
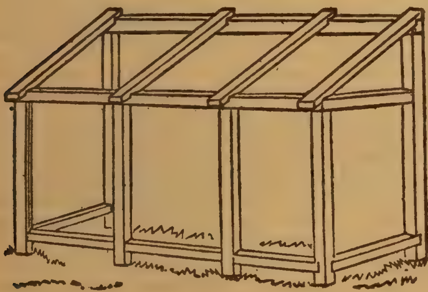


FIG. 2.

FIG. 3.

grooves in the boards before fitting them together with white-lead paint. The roof should be left projecting 3 in. all the way round for eaves, and it may be covered with felt and tarred. [*See* ROOFING (FELT)] The shed door should be fitted on to the tall end, either hinged to (A) or (B). At the opposite end to the door two bars for each bicycle should slant from the end to the floor, between which the back wheel of the machine is placed, and the bicycle is thus kept in an upright position. These bars should be covered with felt or old carpet on the inside to prevent the enamel being scratched off the rim. If the cycles are to be kept in the shed during the winter, it is best to give the shed at least three coats of best paint outside, and line it inside throughout with felt. During very wet weather a lamp may be left burning in the shed to drive off moisture.

SHED: FRUIT. Make the frame from 3 in. × 3 in. deal, as shown in the illustration, the pieces being fitted together with halved joints, as in SHED (CYCLE). Board up the floor with ⅞ or 1-in. match-



boarding, the sides and roof with ⅝ or ¾-in., and cover the roof with felt. [*See* ROOFING (FELT)] Run shelves along lengthways, so that a man can pass down the centre. A piece of perforated zinc should be let into the top of each end for ventilation, with a hinged wooden flap on the outside. The flap should be cosed du ring very wet and frosty weather. If space be available, fruit and vegetables should be stored so that they do not touch each other. If there be not sufficient room, they should be picked over periodically, and any slightly rotten or damaged fruit removed.

SHED: SHEEP. Make as SHED (CATTLE), but board the ends up to within about 2 ft. 6 in. from the ground, so that sheep and small animals only can enter.

SHELL DECORATION. The principal shells should first be polished by rubbing them with powdered pumice stone, and then with oil and pulverised tripoli on a pad. If the shells are to be attached to the box or frame very close together, they should be cemented on [*see* CEMENT (SHELL)], but if they are to be fairly wide apart it is best to bed them in a putty. Mix whiting and oil to a putty and add a little chrome green, hammer thoroughly, and add oil till it just will not run. If only one coloured shell be used, the putty should be coloured to match. Spread it about ⅛ in. thick on the article, and then bed the prepared shells in it, pressing them down with a knitting needle. Shells of different shapes and colours should be kept in separate boxes; this greatly facilitates making the patterns, which is really mosaic work. The work when finished should be varnished with thin copal varnish. This takes away from the effect a little, but the ornament is more readily cleaned.

SHELL: HOW TO ETCH. Cover the shell with (1) beeswax, (2)

a mixture of 1 oz. white resin, ½ oz. white wax and 2 oz. asphaltum. Draw the pattern on the shell, scraping away the wax with a hard lead pencil. Cover the shell with strong acetic or dilute hydrochloric acid and leave for from 1 to 4 hrs. Wash off the acid with water, and then remove the wax with turpentine. To etch a raised ground, draw the design in varnish and immerse in acid. [*See also* ETCH METALS (HOW TO)]

SHELVES: HANGING GLASS. Use a long narrow sheet of glass for each shelf, and drill a hole near each corner of each sheet. [*See* GLASS (HOW TO DRILL)] Bind each shelf with ribbon, and pass ribbon from one hole to the other, at both ends of the shelf, so that the glass may be held in a sort of sling. Pass ribbons backwards and forwards through the holes of the next shelf, so as to go both under and over. The remaining shelves are similarly treated, being held apart the required distance. Catch the four ends of ribbon together, two at each end, under a rosette, and hang up by a hook in the wall, and put bows beneath each hole in the lowest shelf.

SHELVES: HANGING WOOD. Cut ⅜-in. mahogany or some suitable wood to the size of the shelves required, those at the top being made smaller than those at the bottom. Drill ¼-in. holes ½ in. away from the edge at each corner in each shelf. Cut four lengths of blind cord, coloured to suit the wood, tie a knot in each end, and slip each end through a spool, and then through the holes in the bottom shelf from the under side. Pull the cords tight, so that the shelf rests at each corner on a spool. Now tie another knot in each cord at equal distances from the bottom shelf, slip on four more spools, and then a shelf as before. Tie another row of knots for the third shelf, and so on, till all the shelves are suspended. Now tie the two pairs of cords together, and suspend them from hooks.

SHOOT BOARD. Cut three pieces of beech of the same length and thickness, but of different breadths, and plane them up perfectly square. Then screw them together, so that all the edges are flush at the back, but at the front they will make three steps. This block will facilitate planing up small pieces of wood square. Place the piece of wood to be squared on the top of the second step, and then place a jack plane sideways on the top of the first step. The iron of the plane will then be exactly at right angles to the wood to be squared, and if the plane be slid backwards and forwards, the edge of the wood will be planed up square. Several different-sized blocks should be made to suit the work. The smaller sizes will be found most useful, for large pieces of wood can be squared up in a vice.

SIEVE: HAND. Cut No. 9 wire into about 80 lengths of from 4 to 5 ft., and bend the last ¾ in. at both ends at right angles. The sieve should be 2 ft. to 2 ft. 6 in. wide, and the wires should be pitched with ¼-in. air space between them. Take two pieces of board, as long as the sieve is to be wide, and drill holes and drive the wire into the holes, as shown in the illustration. If the wires are all made the same length, and driven across the plank in line, they are more liable to work loose. Once in every 7 in. braid fine soft annealed wire across the heavy wires, to keep the wires the required distance apart. Box the sieve by nailing on end and side boards 5 in. wide. These boards are nailed flush to the bottom and form a box

on the top. To sift, set the sieve

at an angle of 45 degs., and throw the gravel against it with a shovel.

SILK: CREASED. Silk articles should not be kept folded in *white* paper, as they are liable to be bleached by it; brown or blue paper is safer, but smooth light yellow paper is the best. Material required for a dress should be made up as soon as possible, or else kept rolled up on a wooden roller, not folded. Hard silk should never be creased as the thread gets broken. To remove the wrinkles from handkerchiefs, etc., moisten the surface evenly with a sponge dipped in very weak glue; pin the material out tightly and evenly over a mattress, and leave it to dry. Some light silk articles may be moistened with gum-arabic, and ironed on the wrong side.

SILK: OILED. Stretch the silk out evenly on a frame; paint it with boiled linseed oil or gold size, and hang it up away from damp to dry.

SILK: HOW TO WASH. Mix together ½ pt. gin, 4 oz. soft soap and 2 oz. honey, and apply with a sponge. Then wash through two waters, to each of which a little ox gall has been added. Hang up to drain and dry, but do not wring. For black silk, pare and slice a good sized potato in 1 pt. warm water, and leave it soaking for ½ hr. in a warm place. Rub the silk with a woollen cloth, and then sponge with alcohol, and after with the potato water. Wind on a roller and do not iron.

SILVER: HOW TO CLEAN. (1) Ordinarily mix 2 parts methylated spirits and 1 part ammonia with whiting to a thick cream. Smear this over the silver and allow it to dry before polishing it off. Soap and water should only be used in exceptional cases. If the silver be rather dirty in corners, steep it in soap lyes for three or four hours before smearing it with the paste. If the silver be greasy, remove it with hot water and soda; or if exceptionally so, as in the case of candlesticks, use alcohol. Then cover with the paste. (2) To remove sulphur stains, such as those on egg spoons, (*a*) rub with the water in which potatoes have been boiled; (*b*) a solution of potassic manganate; (*c*) a solution of ¼ oz. potassium cyanide in 10 oz. water. (3) For very badly-tarnished silver apply one of the following: (*a*) Rub over with a solution of 1 part sulphuric acid to 10 parts water with a flannel. (*b*) Boil in the solution of sulphuric acid. (*c*) Heat the silver and then quench it in the solution of sulphuric acid. Repeat again if necessary. After treating in either of the three methods, rinse in clean water, and then dry over a water bath or in boxwood sawdust. (4) For delicate filigree work (*a*) cut lemons into slices and rub the article with

them; then cut a lemon nearly in half, insert the article, close up the lemon, and leave for a few hours. Then take it out; rinse in two or three waters, place it in very hot, but not boiling suds; rinse again, and then dry on a metal plate over hot water, or in boxwood sawdust. (*b*) Boil in a solution 1 part cream of tartar, 2 parts salt and 50 parts water till clean. Then rinse and dry as for (*a*). If silver articles be stored wrapped up in silver paper they will not become tarnished.

SILVER: OXIDISED. (1) Powder fine and mix 2 parts copper sulphate, 1 part saltpetre and 2 parts sal-ammoniac, then dissolve in the least possible amount of concentrated acetic acid. Warm the silver and the liquid, and immerse or apply with a brush. The colouring is of a brownish black, and may be scratch-brushed. (2) Powder and mix 1 part common salt and 2 parts saltpetre with concentrated hydrochloric acid in a plumbago crucible, and boil. Immerse the silver, or apply the liquid with a brush. (3) Immerse the silver in a hot solution of perchloride of platinum. The depth of the tint depends on the strength of the solution, and the length of time the silver is immersed. (4) Boil the silver in a mixture of 5 oz. bromine, 120 grs. bromide of potassium and 10 oz. water in an earthenware pot for from 3 to 5 mins. This colours the metal a deep black, which may afterwards be polished with jeweller's rouge and wash leather. (5) Dissolve 2 drs. sulphide of potassium or ammonium sulphide in 1 pt. water, and heat to about 175° Fahr., and then dip the silver in for a few seconds. This gives a blue black coloration.

SILVER: HOW TO WET COLOUR OR FROST. Immerse the metal in a mixture of hydrochloric acid, nitre, salt and alum. This liquid will also frost gold.

SIPHON. The siphon is a tube bent like a U, but having one leg of the U longer than the other. The tube is then filled with water, a finger placed over each end, to prevent the water draining out, inverted, and the short leg placed in the tank. Now remove the finger under the water in the tank first, and then the finger stopping up the long leg. The water will then flow through the siphon out of the tank, as long as the short leg is immersed in water. Another way is to place the short leg in the tank as before, and suck the long leg till the action is started. A good way is to use a piece of rubber tubing, and hold it bent, while the water drains out. No siphon will work if the distance from the water level to the bend of the U is more than 30 ft., or if the end of the leg outside is higher than the top of the liquid in the tank.

SIZE: PARCHMENT. Place parchment chippings in an iron kettle; fill it with water, and leave it for 24 hrs. Then boil for about 5 hrs.; remove the scum, and strain through cloth.

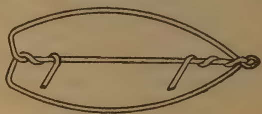
SIZE: SIGNWORK. Place a pan of linseed oil over a fire. When it begins to smoke, set fire to the oil, allow it to burn for a moment, and then extinguish it by putting the lid on. Remove the pan and use the oil when cold. The oil may require thinning with turpentine before use.

SKIN BIRDS: HOW TO. The instruments required are a scalpel, which is like a very small bone paper-knife, a small pair of forceps, a small-bladed and very sharp knife, a pair of sharp fine scissors, plaster of Paris, or some fine hard wood sawdust (dust from fretwork), and arsenical soap. [*See* SOAP (PRESERVATIVE)] Take the bird, and stuff the mouth and nostrils tightly with cotton-wool. If the eyeballs be broken, stuff them also full of

cotton-wool; in any case it is desirable to rub underneath the eyelids with a small piece of cotton-wool held in a pair of forceps. Every shot hole must also be plugged with cotton-wool. If the feathers be covered with blood, dip a small sponge in hot water, squeeze it as dry as possible, and clean the feathers; the sponge should be often squeezed out, and kept clean. When they are fairly clean, remove as much moisture as possible with a dry sponge. Then lift up the feathers with a stout piece of blunted wire, and scatter plaster of Paris plentifully all round them, and beat smartly with the wire, continually adding more plaster and beating. In a short time the feathers will be quite dry and clean, when the plaster should be brushed out with a hare's foot. Turn the bird on its back, the head pointing towards the operator, and open the feathers along the centre of the breast, where a natural bare place will be found. Cut the skin with the knife or scissors from the middle of the breast-bone to the vent. The incision may be cut deep in the breast, but care should be taken lower down only to cut the skin, or the entrails will fall out and soil the feathers. Now pick up the edge of the skin on one side, and if the bird be small, insert the scalpel, and waggle it about sideways to separate the skin from the flesh. Do not pull the skin, for it will be stretched or torn. As the skin is separated, sprinkle plaster of Paris or sawdust between the flesh and skin freely. The skin can thus be separated from near the tail to a good way up the breast and sideways to the leg. Repeat on the other side. Now take one of the legs and press it inwards, pushing the skin down it till the knuckle becomes visible. Cut the knuckle with the scissors, taking care not to cut the skin, and then pull the leg back from the outside. Repeat on the other leg. Now work round with the scalpel as before, using plaster or sawdust freely. With care sever the vent from the body. The skin can now be worked off the flesh all the way round the back near the tail. When perfectly free, cut the flesh away at the root of the tail (if the root of the tail be cut the feathers will fall out), and then with an upward cut sever the back-bone. Now turn the tail back, and skin all up the back, turning the skin inside out. Do not pull the skin, but work it with the finger-nail, and carefully scrape with the knife. When near the wings, push them inwards, and sever at the knuckle, just as the legs were severed. Continue skinning as before over the shoulders, but when the neck is reached, push the skin away, and be very careful not to pull. Continue turning the skin inside out over the skull. The ear tubes will soon stop farther progress; these tubes may be pulled intact out of the skull by scattering plaster over them, and scratching gently with the nail. A little farther on the eyes come; these must be carefully cut from the skin by lightly passing the knife over the eyeball, leaving them in their sockets. Continue to skin till the base of the bill is reached. The skinning proper is now completed. Cut the neck just below the skull, but not too close, or the jaw-bone will be severed, and the lower mandible will then hang loose. Cut a portion off the back part of the skull, which is left attached to the skin, and remove all the brain with a pin head or some suitable instrument. Now go back to the legs, and press them inwards till the next joint is nearly seen. Remove all the flesh on the bone, and pull the leg back again in place. Repeat on the other leg

and the two wings, and the base of the tail. Thoroughly clean the skull, and go all over the skin, picking off all pieces of fat, etc. Work up the arsenical soap to a good lather with a paint brush, and rub it well into and outside the skull. Cut up tow, and press it into the skull. Fill each eye-socket with cotton-wool, and tie the two leg-bones together on the inside, also the two wing-bones. Now soap the wing and leg-bones, and then all over the skin, soaping the tail base well. Now turn the skin right way out again, by pushing the beak back down the neck. Make up a piece of tow the same size and shape as the neck, and insert it in the skin, pressing it, and adding to it till the neck looks right. Use a blunted piece of wire to force the tow in. Now fill up the spaces left by the muscles in the legs and wings. Next copy the body in tow by binding pieces of tow together with cotton till of the correct shape. Place this in the body, and then press a piece of wire, which should be as thin as possible with one end sharp, through the body and out at the forehead. Nip the wire off flush with the head, and sew up the cut down the breast with small stitches. Press and squeeze the body into shape, and finally smooth down all the feathers by raising them with the eye end of a needle, and then brushing them down with a hare's foot. Stuffing a bird requires a great deal of experience, and should be learnt by taking lessons from a taxidermist. After learning to skin from the notes given here, it would be a great advantage to have a few practical lessons from a professional.

SKIN FISH: HOW TO. Bed the fish down in clay, leaving the best side uppermost, and then pour plaster over it. [*See* CAST (PLASTER FISH-)] Take the fish out when the plaster is set, lay it best side down, and bend a piece of fairly stout copper wire, so that the outside edge of the wire will exactly correspond to the inside of the skin, the fins and tail being left out, as shown in the illustration. The two ends of the wire should be brought out at right angles to fix into the back of the case to support the fish. Note any peculiarity of shape, marking or coloration of the fish, so that when the fish is eventually set up these peculiarities can be formed again, and the colouring painted on. Cover the best side of the fish—the side from which the plaster mould was taken—with tissue paper or muslin, and stick it on with gum or glycerine. Wrap the tail and fins in damp cloths, which must be kept continually damp during the whole operation of skinning and stuffing, or they



will become hard and get cracked. Lay the fish paper-side down in the mould, and cut through the centre of the bone under the gill cover, and continue the cut all along the side of the body to the tail. Now rub sand over the fingers, so that the skin can be held, and work it away from the flesh in the ordinary way. Leave the bones of the tail and fins long, and with plenty of flesh round them, remembering that the skin is thinnest at these parts and at the vent. Now work round over the back, and up underneath, till the fingers meet behind near the tail, and then cut right through there with a pair of scissors. The skin may now be separated from the body readily all over, cutting the flesh away, and leaving it

attached to the fins. When the shoulders are reached, cut away the body at the back of the head, detaching it entirely. Then clean the bones of the tail and fins, and cut the bones off short; also clean away with the fingers any flesh there may be still attached to the skin. Cut through the gills at the top and bottom, and remove each whole. Now cut a slice off the under side of the skull, and remove the brains. Then work round the sides till the eyes are reached, and remove them from the inside. Remove the flesh from the cheeks from the outside, working with small knives and scissors through the eye-holes; then remove the tongue, and all flesh inside the mouth. Finally paint the inside of the skin and head all over with preservative soap. [*See* SOAP (PRESERVATIVE)] To stuff, fill the cheeks with putty, and place a wedge-shaped piece under the jaw; also pieces of putty on the projecting bones of the fins and tail, to support them. Now place the fish in the half-mould, insert the wire frame, and fill the skin half-full with sawdust, bran or plaster of Paris. Drill two small holes in each bone below the gill cover, which was first cut through, and tie them up tightly, as they were before being cut, with thread. Then sew through the gill cover, and then through the skin alternately across the cut, but not too near the edge or it will tear. All the time as the sewing is proceeding, ram in the stuffing material towards the head with the top of a pencil, and press the skin well down into the mould; then end off the thread at the first wire, so that about one-third of the fish is sewn up. Now commence sewing from the tail, ramming in the stuffing material as before, and continue till the cut is completely sewn up, finishing off the thread on the copper wire. Bore two holes in a board, and pass the two ends of the supporting wire through. If the fish looks thin and flat, tap it all along the back with a paper-knife, till the fish assumes the shape it originally had, and which corresponds with the sizes taken. Take the damp cloths off the fins and tail; stretch them out, and pin them between two sheets of cork. Immediately the skin is dry, give it a coat of thin shellac varnish, or the scales will rise as it shrinks; and bind cotton round the gills and mouth till they assume the desired shape. When the fish is quite dry, fit in artificial eyes with putty; and as the skin will most probably be of a dirty uniform tint, it must be painted with oil colours, taking the original sketch and notes and a fresh fish for a guide. Varnish a second time, and when this coat is dry, mould round the fleshy parts of the mouth with wax, so as to hide these parts when they shrivel.

SKIN MAMMALS: HOW TO. Small quadrupeds may be skinned exactly as a bird, treating the fore legs as wings. For larger animals, of which it is desired to keep the skin for rugs and mats, slit the skin round the feet of the hind legs and then join these two slits by a cut on the inside of the two legs and across the bottom of the body. Draw the body through this slit, turning it inside out, and when the fore legs are reached, detach them by cutting round at the wrists. Continue till the mouth is reached, and then detach at the lips. Give the skin a good lather of arsenical soap [*see* SOAP (PRESERVATIVE)], and thoroughly work it in. The skin must be tightly stretched inside out to dry by one of the following methods: (1) Prepare a thin piece of wood that will stretch the body out when inserted inside. Split the wood down the middle and then

insert it in the skin. Tap a very long taper wedge up the middle between the two pieces of wood till the skin is stretched evenly all over, and then tack it lightly in place. For fairly small skins the wedge may be omitted, but the wood must always stretch the skin tightly. (2) Cut a stick of suitable springy wood of the required length and size, and place it inside in the shape of a horse collar. The spring in the wood will keep the skin taut. For receipts for dressing the skins *see* TAN SKIN (HOW TO).

SLED: COASTING, OR TOBOGGAN. Shape two ¾ in. boards of tough wood 28 in. long × 4 in. deep for runners as illustrated. Bore three ¾-in. holes 1¼ in. below the top edge of each runner; bore the first 3 in. from the rear end, the next 7½ in. from the first, and the third 7½ in. in front of the second. Just in front of the centre hole cut a hand grasp in each runner, the top being about 1 in. below the top edge of the board. Cut them 4 in. long × 1¼ in. deep at the centre. Near the point of each runner bore jecting beyond the runner, to make all flush. The top edge of the distance pieces should lie horizontal for the seat to rest on, and it should be ¾ in. below the top edge of the runners. The seat should be made from ¾-in. board, 10 in. wide × 17 in. long, shaped as shown in the illustration. Screw it down firmly on to the distance pieces and at the sides to the runners. The runners may be shod with hoop iron ¾ in. wide × barely ⅛ in. thick. Drill four holes equidistantly apart, so that the iron is attached to the runner at each end, and at two intermediate points. If the holes cannot be drilled, heat the iron red-hot, and then punch a small hole through it quickly. When cold, the hole may be enlarged to the required size with a rimmer, and then countersunk, so that the heads of the screws are slightly below the level of the iron. Now bend the iron to shape, and screw it in place. The back part should be left a little long and well turned up, so that it does not catch when the toboggan is pushed backwards.

a 1-in. hole to attach the drawing rope to. Cut three 1-in. square beams from some tough wood 12 in. long. Cut the last inch on each end down to ¾ in. round, leaving a shoulder, so that they will butt up against the runner when driven into the holes already drilled for their reception. Drive the runners on—they should be a tight fit—and then fasten them in place by driving a screw down from the top edge of the runner through these distance pieces; then cut off the ¼ in. pro-

SLED: FRAMED. (1) Dress out two sticks of ash or oak for runners 1 in. wide × ¾ in. thick × 28 in. long. Steam and bend them to shape. [*See* WOOD (HOW TO STEAM)] After the runners are bent, bore three ½-in. holes through each from top to bottom; the first 4 in. from the back end; the second 9 in. from the first; the third 9 in. from the second. Cut six ¾-in. square hard wood rods 7½ in. long for uprights. Make ½-in. round tenons in each end, so that the shoulders are 5½

in. apart. Drive one end of each into the holes already drilled in the runners, leaving the other ends free for the cross beams to fit on. Cut three hard wood rods $\frac{3}{4}$ in. thick × $1\frac{1}{4}$ in. wide × 14 in. long for the cross beams or distance pieces. Bore two $\frac{1}{2}$-in. holes in each, 1 in. from each end. Before putting the sled together bore two $\frac{1}{2}$-in. holes a few inches from the upper ends of the runners and fit in a stick to draw by. Now drive in the draw stick, and then drive on the cross beams. Drive wedges in all the tenons, across the grain of the mortise, so that they do not split, and trim off all tenon projections flush. The raves (the bars that run parallel to and above the runners) greatly add to the strength of the sled. Make them 2 in. deep × $\frac{1}{2}$ in. thick.

FIG. 1.

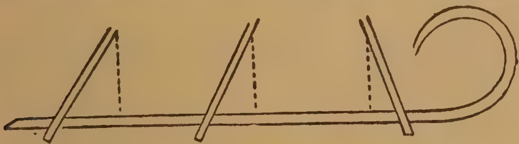


FIG. 2.

FIG. 3.

They should be long enough to project $2\frac{1}{2}$ in. behind the rear beam, and bent in front to reach the runners as shown in the illustration. Fasten by two screws driven into each upright, and also at the end where it joins the runner. The seat should be made of $\frac{3}{4}$-in. wood shaped as shown. The sled may have $\frac{1}{4}$-in. iron braces if desired, but a well-made wooden article is best without iron braces at all, for the iron does not spring as the wood does, and so the joints get racked. The runners should be shod with iron. [*See* SLED (COASTING)] (2) A fancy sled is shown in Figs. 2 and 3. This is made materially as No. 1, but the runners are bent round, and fit into the seat instead of using raves. The uprights are fitted slanting; the rear one inclining 4

in. forward; the centre one inclining 2 in. forward; the forward one inclining 2 in. backward.

SMOKED WALLS: HOW TO CLEAN. Mix 1 pt. wood ashes to a small pail of whitewash just before applying it.

SNOW SHOVEL. Cut a piece ½-in. deal 12 in. wide × 17 in. long for the blade, and plane it down at the cutting edge rounded. Upon the back end screw a piece of ¾-in. ash or tough wood, 5 in. wide × 12 in. long. In the centre, from end to end, and near the top edge, drill a hole slanting downwards and

forwards, so that the handle, when passed through this hole, will strike the blade 5 or 6 in. below it. Bevel the end of the handle, so that it lies flush on the blade, and then fix it there with a staple or a screw. The handle should be long enough to prevent stooping when at work, and the whole should be as light as possible.

SOAP. (1) Set a barrel on an inclined platform; place a few sticks in the bottom, and cover with a piece of carpet or woollen cloth. Cover the carpet with a few inches of ashes made from sound beech, maple, or any hard wood excepting oak, and then 4 to 8 qts. lime Moisten and tamp down well, firmest in the centre. After 24 hrs. the ashes should be mixed up again, those on the top thrown away, and new ashes added to replace them. Then damp with water, which should be boiling for this second leaching. Mix 1 lb. concentrated lye in 1 gal. boiling soft water, and leave for about 10 hrs.; then add 1 gal. soft water, and boil. Add 4 lb. clear melted grease slowly, and stir briskly, letting it *boil* slowly for about 6 hrs. Then add 4 qts. hot water, in which 2 tablespoonfuls of borax have been dissolved, then 4 tablespoonfuls resin and 1 teacupful salt. Cook for about an hour, when the soap will most probably be made. To test, dip a stick in the mixture, and if the soap drop off clear and hardens quickly it should be poured out into open vessels and cut up into bars when cold. (2) Dissolve 17 lb. caustic soda in 180 lb. water. Melt 100 lb. fat, and then add nearly all the caustic soda solution, a little at a time. *Boil* and stir for several hours, and when the mass is homogeneous throughout, throw in salt till the soap rises as a curd. Then run off the waste lye, and boil again, adding the remainder of the caustic soda solution. When the mass becomes smooth and pasty, pour it out into moulds. (3) Melt 100 lb. fat, and allow it to cool to 100° Fahr. Dissolve 17 lb. caustic soda in 65 lb. water, and warm it to 80° Fahr; then add it to the fat, and keep stirring for ½ hr. When as a homogeneous pasty mass, pour it out into covered moulds, and keep it at about 70° Fahr. for a few days. For large quantities of soap mix 1 part caustic soda with 5 parts fat; for small quantities mix 1 part caustic soda with 4½ to 4 parts fat.

SOAP: ERASIVE. Boil 1 lb. finely-shred soft soap, 1 oz. borax, ½ oz. saltpetre and ½ oz. ammonia in 1 qt. soft water. This soap is useful for washing off grease, etc., and forms a base for other soaps, such as shaving soap.

SOAP: GELATINE. Warm very slowly and gently, and stir till dissolved, 2 lb. white olive soap finely shred and 2 oz. borax in 2 qts. cold water. When cooled the soap sets as a jelly. 1 cubic inch of jelly will make 1 gal. of lather.

SOAP: GLYCERINE. Mix 1 pt. alcohol with 1 pt. water, and

warm over a fire. Then add 1 lb. finely-shred olive oil soap, and when the soap is dissolved, and the greater part of the alcohol evaporated, add 1 lb. glycerine. Stir for 2 or 3 mins., and add any desired perfume.

SOAP: HARD. (1) Mix 2 lb. clean unslaked lime, and 6 lb. soda ash with 8 gals. water. Heat, and when boiling strain it, and return the liquid to the kettle. Then add 12 lb. clear grease, and boil for 3 hrs.; then leave to cool slowly. Remove the hard cake formed, without touching it with the fingers. Put it into a clean pot, and add 1 lb. finely-pounded borax. Stir it, and heat till melted; then pour it out into moulds, which have been previously well soaked in water. Set to dry in an airy place, but not in the sunshine, for the first few days. Pack the soap away in a dry place. The liquid remaining in the pot will make another lot of soap, if 4 lb. grease be added, but it will be of an inferior quality. (2) Soak 5 lb. unslaked lime and 5 lb. soda in 3 gals. soft water for 12 hrs. Then strain, and add 3½ lb. clear grease. Boil it till thick, pour it out into a pan to cool, and cut it into bars. (3) Boil 3 lb. quicklime and 7 lb. soda in 4 gals. water till dissolved. Leave it to settle, and then pour off the clear liquid. Add water to this liquid to make up to 4 gals., and add 4 lb. grease and 2 tablespoonfuls borax, and boil till thick. When cold cut the cakes rather larger than the desired shape, for the soap shrinks in drying. (4) Mix thoroughly 6 lb. soda and 3 lb. quicklime in 4 gals. soft water. Strain, and then add 6 lb. clear grease. Boil for 20 mins., pour it out into a pan, and before it gets perfectly cold, cut it up into bars. (5) Simmer together 5 pailfuls soft soap, 2 lb. salt and 1 lb. resin. When thoroughly mixed, turn it out into shallow pans, and when cold, cut to shape.

SOAP: HONEY. Dissolve 1½ lb. finely-shred white soap, and ½ lb. finely-shred windsor soap in soft water. Then add 4 oz. honey, and keep all hot till all the water is evaporated. Perfume as desired while the soap is hot, and cut it up into cakes when cold.

SOAP: LABOUR SAVING. Mix 4 oz. quicklime in 1 gal. cold soft water, and then strain. Dissolve ½ lb. soda in 1 qt. water and mix it with the lime water. Dissolve 1 lb. finely-shred brown soap in 1 gal. water, and add it to the soda and lime water. This soap is useful for boiling greasy fabrics in.

SOAP POWDER. Mix 6 parts yellow soap, 3 parts soda crystals, 1½ parts pearlash, 1½ parts sulphate of soda and 1 part palm oil. Spread out to dry, and then grind up to a powder.

SOAP: PRESERVATIVE. (1) Mix 5 oz. camphor, 2 lb. white arsenic, 2 lb. white soap, 2 oz. salts of tartar and 4 oz. chalk. This soap is very strong, and is the usual arsenical soap. (2) (*a*) Stir 12 oz. best white soap shavings in 1½ pts. water; when dissolved add 1 oz. arsenic and 1 oz. corrosive sublimate. (*b*) Dissolve 1 oz. camphor in 8 drs. spirits of wine. Mix (*a*) and (*b*) together. (3) Boil 1 lb. white curd soap shavings or soft soap with 2 to 3 lb. whiting in 1 qt. water. Take it off the fire, and stir in 2 oz. chloride of lime. When cold, add 1 oz. tincture of musk, and then bottle in air-tight receptacles. This preservative soap is often used on small skins, and it has the recommendation that it is not poisonous, whereas Nos. 1 and 2 are.

SOAP: TO REFINE. Dissolve 1 pt. salt in 2 gals. soft water, and boil 6 lb. finely-shred soap in this brine for 2 hrs. Pour it out into a pan to set, and when cold cut into bars, scrape the sediment from the

bottom, and lay on a shelf to drain. Then expose to bright sunlight for some considerable time.

SOAP: ROSE. Mix 2 lb. finely-shred white soap, 3 lb. finely-shred olive oil soap and ½ lb. rose water in a pot. Hang this pot in water, which is just kept below boiling, till the soaps are thoroughly mixed. Then add ½ oz. (more or less according to the shade required) finely-sifted vermilion. Take the soap out of the hot water and add ½ oz. otto of roses, and ¼ oz. bergamot.

SOAP: SHAVING. (1) Make as erasive soap [*see* SOAP (ERASIVE)], excepting that ½ pt. water should be used instead of 1 qt. (2) Heat 2¼ lb. lard, 8 oz. caustic potash and 2 pts. water in a pan, and mix thoroughly. Leave it to simmer, and the water to evaporate, till as a thick creamy paste; then place it in a mortar, and beat it up with a few drops oil of almonds and oil of bergamot. The soap is then ready for use.

SOAP: SOFT. (1) Heat soap grease up in a weak lye, but do not boil it. After the grease is well eaten, fill the pot with water, and let it stand until the grease rises in a crust to the top. Use 10 lb. of this risen grease to 6 lb. potash for the soap. Dissolve the potash and strain the lye into the place where the soap is to be kept. Melt the grease, and add it, stirring briskly. Add water to make the quantity up to a ½ barrel; stir several times a day till good soap is formed. (2) Dissolve 13 lb. potash (gray coloured is best) in hot soft water. Then add 17 lb. grease, and keep on adding hot water till it stirs readily. Melt 12 oz. resin in 3 lb. grease, and stir this into the mixture. These quantities will make 1 barrel soap. Only the best lye should be used for soft soap. Soft soap sometimes appears to be good, but changes after a few days. This is probably due to making the soap too strong, and then adding water. If very strong it will be thin and dark, and by adding cold water, and thoroughly stirring, the colour is changed, and the mass thickened. This gives it the appearance of good soft soap for a few days only.

SOAP: STAIN-REMOVING. Place 2¾ lb. best white soap shavings with 1 lb. water and 1½ lb. ox gall in a boiler. Cover it over, and leave for 24 hrs., then heat up slowly, regulating the heat, so that all dissolves and mixes without stirring. When homogeneous, add 1 oz. turpentine and ¾ oz. benzine and mix. Whilst melting, colour with ultramarine and ammonia, and then pour out into moulds. The soap should not be used till it is at least a week old.

SOAP: TOILET. Boil 6 lb. soda and 3 lb. quicklime in 4 gals. soft water till dissolved. Leave it to settle, decant the clear liquid, and then add 7 lb. clear grease. Boil till it is of the consistency of honey; then add perfume and vermilion to colour as desired.

SOAP: TRANSPARENT. Mix 1 lb. finely-shred brown bar soap in ½ pt. alcohol. Place this in a pot, place the pot in boiling water, and leave the water boiling for 10 mins. Remove the pot from the water, add a few drops of bergamot or lemon, and turn into moulds.

SOLDER. To run the solder out into wire, punch a hole in the bottom of a ladle; pour molten solder into it, and move it over a saw blade or a piece of cold stone, thus allowing the solder to pour out and form a thin stick. The thickness of the wire depends on the speed at which the ladle is moved, and on the size of the hole punched. In making solder it is important to thoroughly mix the molten metals. First melt the constituent, which has the highest

melting-point, and add the others in their order. Melt soft solder under tallow, and hard solder under charcoal, to prevent oxidisation.

Hard or Brazing: (1) Melt and mix 3 parts copper and 1 part zinc. This solder is the hardest brazing. (2) Melt and mix 1 part copper and 1 part zinc. This solder is medium hard brazing, and is the usual spelter of commerce. (3) Melt and mix 4 parts copper, 3 parts zinc and 1 part tin. This solder is soft brazing. (4) Melt and mix 2 parts tin and 1 part antimony. This solder is soft brazing. (5) Melt and mix 2 to 3 parts silver with 1 part No. 2 solder.

Soft: (1) Melt and mix 2 parts lead and 1 part tin. This is the usual soft solder of commerce. (2) Melt and mix 3 parts lead and 2 parts tin. This is employed for soldering lead. (3) Melt and mix 2 parts tin and 1 part lead. This is employed for soldering pewter. (4) Melt and mix 2 parts lead, 1 part tin and 2 parts bismuth. This solder melts at a high temperature. (5) Melt and mix 4 parts lead, 4 parts tin and 1 part bismuth. This solder melts at a low temperature.

SOLDER COPPER: HOW TO. Scrape the parts of the metal that are to be joined together quite bright with a knife or emery cloth, keeping off all grease, and then sprinkle powdered resin (or the necessary flux) over them. Place the soldering iron in a wood or coke fire, and when sufficiently hot, press it on to some powdered resin, or wipe it with a damp cloth. Immediately after press the end of a stick of solder on it, which should melt, and a globule of solder should then hang from the tip of the iron. Press the iron with the solder attached over the edge of the joint, and press the solder wire against the iron. The solder will melt and flow all along the joint. Remove the wire, and work the melted solder well in with the iron, and whilst molten, press the joint together and wipe off all the superfluous solder with a piece of waste. When the surface of the copper bit of the iron gets black, and the solder will not attach itself, file the iron till it is bright, and then rub it whilst hot on a piece of hard wood and powdered resin. Now rub the solder on, and it will immediately silver. For small work, first tin all the parts which are to be joined together, using killed spirits for a flux; then hold them in place with a small hand-vice or pliers. Use a very small blow-pipe, or a spirit-lamp, and solder without an iron, if possible,. Where joints make a very good mechanical fit, moisten them with killed spirits, place a piece of tin-foil between, bind them tightly together with wire, and hold them in a clear flame till the tin melts. To solder very small and fine articles, cut a piece out of a raw potato, put the fine work into the hole and cover up with the plug of potato cut out, leaving only the part to be soldered outside. Then solder as quickly as possible with a very small blow-pipe or spirit-lamp. Where two joints have to be made close together, solder the first with solder made to melt at a high temperature, and the next with solder of a low melting-point. This prevents the first joint from coming to bits, whilst the second is being made.

SOLDER FLUXES. (1) Borax, used exclusively for hard soldering. [*See* BRAZING] (2) (*a*) Resin, (*b*) resin boiled in oil, (*c*) powdered resin mixed with oil or tallow, (*d*) Russian tallow. Pure resin is used very generally for soft soldering brass, copper, etc., and almost exclusively for electrical work. Resin and oil or tallow is used for soldering pewter, lead, etc. (3) Killed spirits. This flux is made by placing granulated zinc in hydro-

chloric acid till it will dissolve no more; sometimes it is diluted with water, and a little sal-ammoniac added. This flux is corrosive, and should not therefore be used for electrical work. The joint when completed, should be rubbed over with a damp cloth. It is used for copper and its alloys, zinc, bright iron, and to tin metals generally. (4) Venice turpentine, Gallipoli, olive oil, etc. These fluxes are used for Britannia metal, and similar metals of low melting-point. See also No. 2.

SOLDER GERMAN SILVER: HOW TO. Cover the edges of the joint with killed spirits; sprinkle powdered pewter over, and melt it with a blow-pipe.

SOLDER IRON AND STEEL: HOW TO. First tin the iron, using resin or killed spirits for the flux. Then clamp the pieces firmly together in a vice, and solder together, using a blow-pipe. If the joint be fairly good, it will not be necessary to run any more solder into the joint than that used for tinning. Asbestos should be placed between the vice and the iron to prevent too much heat being conducted away. To join small pieces of iron together, first clean and tin them, then hold them together with pliers, and work round the edges with a hot soldering iron, without adding any more solder. Iron or steel is generally brazed. [*See* BRAZING]

SOLDER SILVER: HOW TO. Place small pieces of charcoal into an iron dish, lay the silver on the top, and surround the part to be soldered with lumps of charcoal slightly larger, leaving a hole for the blow-pipe. Use hard solder [*see* SOLDER (*hard or brazing:* No. 5)] and powdered borax for a flux.

SPATTER WORK. Arrange pressed leaves, ferns, etc., to form a bouquet or design on a sheet of good paper, and pin them down lightly with fine needles. Dip a tooth-brush into the required pigment, shake it as dry as possible, and then rub it over the bottom of a fine sieve, perforated zinc, or comb, so that the minute drops, which fall as a fine spray, settle on the leaves and paper. Work most over the centre, and shade off gradually towards the border. After the paper has a decided tint, the top leaf or fern may be removed. Now continue with the tooth-brush as before; after a time remove another spray, and so on. When finished, the forms of the leaves will be shown, those left on all the time will be the colour of the paper, whereas the leaf first removed will be shaded dark, and the leaves removed in between will be of intermediate shades. The pigments may also be varied, using liquid Indian ink for black, burnt sienna for brown, etc. Always work with the brush nearly dry, and after dipping the brush into the ink, try rubbing it on the perforated zinc over a spare sheet of paper first to see that the spray is fine enough. This spatter work may be used for ornamenting small boxes, etc., which should afterwards be varnished.

SPONGES: HOW TO CLEAN. (1) When toilet sponges become sodden, and feel greasy, squeeze them as dry as possible, place them on a plate, and sprinkle powdered calcium chloride over them. After 30 mins. rinse, and dry. (2) Soak the sponge in a warm solution of 1 part hydrochloric acid to 5 parts water for 30 mins.; then rinse it in clean water, and steep in methylated spirits for 30 mins.; then rinse two or three times in water, and dry. [*See also* BLEACH SPONGES (HOW TO)]

STAIN. It is best to stain the wood first, and then to varnish it; not mix the pigment with the varnish as a lacquer, for the pig-

ment does not in that case soak into the pores of the wood, and colour the fibres. It is also better to make two applications of a medium stain than one application of a strong stain. The tint of the stain is nearly always altered after polishing or varnishing, so if a tint must be matched, a sample should be worked right through, and then the stain modified if necessary.

STAIN: ANILINE. These stains are useful for pure colours, as for inlaid work, where wood is not to be imitated. A little vinegar should be mixed with the stain, which prevents fading to a great extent. The directions on the wrappers of the stains should be carefully followed.

STAIN: BLACK. (1) Boil 2 oz. logwood extract, 1½ oz. copperas and a pinch of indigo in 1 qt. water, and apply hot. Repeat two or three times. Steep 2 oz. steel filings in ½ pt. vinegar, and give two applications of this on the top of the first stain. (2) For apple, pear, walnut, and all fine-grained woods, boil in an enamelled iron vessel 4 oz. ground gall nuts, 1 oz. logwood chips, ½ oz. green vitriol and ½ oz. crystals of verdigris in water. Filter while warm, and brush the wood repeatedly with it. Dry and brush over with a strong cold solution of sulphate or acetate of iron, and dry. Repeat several times, and finally dry at a moderate temperature; then oil or varnish. (3) Mix pulverised asphaltum in naphtha to the required shade. This must be kept in a corked bottle, and laid on quickly. Then brush over the wood with very dilute sulphuric acid, and hold it to the fire. The stained wood will receive a good polish. (4) Apply nitrate of silver, and expose it to the light. A wash of carbonate or bichromate of soda may be given afterwards, which improves the colour, but it is not necessary. (5) Mix chlorhydrate of aniline with water, and then add a small amount of copper chloride. Apply it to the wood with a sponge, and when dry go over with a solution of potassium bichromate. (6) To turn oak black, boil 1 part logwood chips in 10 parts water, filter through linen, and evaporate at a gentle heat, until the volume is reduced to one half. Mix 10 to 15 drops of a saturated indigo solution with 1 qt. of the logwood water. Immerse the oak in a hot saturated solution of alum for 48 hrs. Brush over the oak with the stain several times, and then rub it with a filtered and saturated solution of verdigris in hot concentrated acetic acid. Repeat till the desired shade is obtained. [*See also* STAIN (OAK)] (7) Put iron filings in good black ink and leave for two weeks. Rub the stain into the wood and polish.

STAIN: BLUE. (1) Boil 4 oz. turnsole in 3 pts. lime water for 1 hr. (2) Dissolve indigo or china blue, or both, in vinegar or dilute sulphuric acid. The addition of whiting makes the stain more opaque.

STAIN: BROWN. (1) Dissolve gum-catechu in water, and apply to the wood; when dry, apply a solution of bichromate of potash dissolved in water. This stain is suitable for soft white woods. (2) Mix 3 oz. of the necessary pigments with 1 pt. vinegar or ammonia water. (3) Heat the wood gently at the fire, and then apply dilute aqua fortis with a feather until the desired tint is obtained. When dry, oil and polish. This method is sometimes used for hard white wood, but not often, for it rots the wood. [*See also* STAIN (CEDAR: IMITATION). STAIN (MAHOGANY: IMITATION). STAIN (OAK: IMITATION). STAIN (ROSEWOOD: IMITATION). STAIN (WALNUT: IMITATION). etc.]

STAIN: CEDAR, IMITATION. Mix 2 oz. caoutchouc and 1 oz. caustic soda in 1 pt. water, and boil the wood in it for some hours. Then rinse in clean water, and dry. If the tint be not deep enough repeat. This stain can only be applied to white woods.

STAIN: FLOOR. (1) Dissolve 4 oz. asphaltum and 8 oz. beeswax in 1 gal. turpentine. If found to be too thin, add more beeswax; if too light, add more asphaltum. (2) Warm glue size in a jar, roll a piece of calico into a ball, dip it into the size, then into burnt umber powder, and rub into the wood with the grain. Clean all grease from the boards before applying the stain, then rub lightly over with sand-paper, and varnish. If it be desired to stain alternate boards, plane a piece of thin wood bevel at one side. Slip the bevelled edge into the crack between the boards to prevent the stain going on to the next board. This board is shoved along the crack as the stain is applied.

STAIN: GREEN. (1) Mix 2 oz. verdigris, ¼ oz. sap-green and ¼ oz. indigo in 1 qt. strong vinegar. The sap-green and indigo may be varied for different tints. If a light green only is required, the sap-green and indigo may be omitted. (2) Mix acetic acid with copper filings.

STAIN: HORN. *Black:* (1) Steep brass in aqua fortis till it is turned green. Wash the horn with this aqua fortis once or twice, and then put it in a warm decoction of logwood and water. (2) Dilute nitrate of silver till it does not corrode the surface of the horn. Apply three or four coats at considerable intervals, placing the horn in the sun between them.

Green: Boil the horn in alum water, then place it in a hot solution of verdigris, ammonia and white vinegar.

Red: Boil the horn in alum water, then place it in a hot solution of verdigris, ammonia and white vinegar. Then place in red stain. [*See* STAIN (RED : No. 1).]

Tortoise-shell: Mix and dissolve equal quantities of glue, lime and red lead in strong soap lyes. Lay it on to the horn with a small brush, imitating the mottled appearance from some model. Repeat two or three times, allowing the stain to dry after each application before applying the next.

STAIN: IVORY AND BONE. First polish the ivory or bone with whiting and water, wash off the whiting, and steep it for 3 or 4 mins. in a solution of 1 part commercial muriatic acid in 40 to 50 parts water. Remove with a pair of wooden tongs, rinse, and then dye. The ivory must not be touched with the fingers or anything greasy after it is removed from the acid bath.

Black: Boil the ivory in a strained decoction of logwood, and then steep it in a solution of red sulphate or red acetate of iron.

Blue: Dissolve indigo and potash in water, and then mix it with vine ash lye.

Green: Mix ¼ oz. verdigris, a handful of salt and a pinch of alum with 1 qt. strong vine ash lye; boil to one half, and then strain. Immerse the ivory in the boiling hot liquid, and leave till cold, or till of the required tint.

Red: Make a strong decoction from logwood chips or extract, and while hot add lead dross. Keep over a slow fire till the colour has taken, and then add a little rock alum. Strain through linen, and immerse the ivory.

STAIN: MAHOGANY. To make new and pale mahogany appear older and of a richer tint: (1) Apply a solution of 1 oz. bichromate of potash in 1 qt. water with a small sponge, and expose the

wood to sunlight. The wood may first be oiled, but in that case the stain must be rubbed in very thoroughly. This is the method usually employed commercially. (2) Subject the wood to ammonia fumes. [*See* STAIN (OAK)] This method is perhaps the best, but more troublesome than No. 1. (3) Apply a stain made from alkanet root and oil. [*See* STAIN (WALNUT)] (4) Apply a solution of washing soda. (5) Slake quicklime in water, and apply the lime to the wood for a dark stain, or the lime water for a lighter stain. This method is useful for small repairs, but gives a blotchy appearance if applied over a large surface.

STAIN: MAHOGANY, IMITATION. (1) First stain the wood lightly with walnut stain, and when dry go over with a solution of Bismarck brown in water. (2) Mix 15 grs. alkanet root, 30 grs. aloes and 30 grs. dragon's-blood in 500 grs. alcohol (95 per cent.); place it in a bottle, and cover with a piece of bladder. Keep the bottle in a warm place for three or four days, and shake it up periodically; then filter, and pour into a clean bottle. First go over the wood with dilute nitric acid for a mordant; allow it to dry, and then go over with the stain as often as necessary to obtain the required tint. If graining be required, imitate by the use of iron acetate. (3) Mix 1 pt. methylated spirits with ½ oz. carbonate of soda, and then mix in 1½ oz. dragon's-blood. First go over with nitric acid and then apply the stain as in No. 2. (4) Dissolve 8 oz. madder and 2 oz. logwood in 1 gal. hot water. Apply the stain, and when dry go over with a solution of 1 oz. pearlash in 1 gal. water on the top.

STAIN: OAK. To make new oak appear old and of a dark tint: (1) Select a good packing-case, and glue brown paper over all joints and cracks, leaving the lid loose. Small panes of glass may be let into the sides of the box so that the tint of the wood can be watched or matched. Remove all grease and glue from the oak, and afterwards handle it with a clean cloth or shavings. Set it in the box, keeping it about 1 in. from the bottom, sides, and the next piece of oak by means of small wood blocks. If possible, set the oak vertically, as it stains best in that position. Place two or three small saucers in the bottom of the box filled with 880 ammonia; ½ pt. ammonia being sufficient for 150 cub. ft. of wood. Screw down the lid, and glue brown paper round the cracks as before, so that the box is absolutely airtight. Leave the wood for from 6 to 12 hrs., and touch up where necessary with raw ammonia or French polish. (2) Apply a solution of bichromate of potash in water. [*See* STAIN (MAHOGANY: No. 1).] (3) Apply a solution of washing soda. (4) Apply lime water or slaked lime. [*See* STAIN (MAHOGANY: No. 5)]

STAIN: OAK, IMITATION. (1) Mix whiting and ochre with water till it is found by experiment to dry the required tint. Pour off the clear water, and mix 3 lb. of the whiting and the ochre with 1 lb. patent size, and apply. When dry give a second coat, and rub lightly down with glass-paper. Mix water-ground pigments with beer; apply it over the size, and grain with a stiff brush and chamois leather. When dry apply a varnish diluted with an equal part turpentine, and then grain again, if necessary. (2) Mix 2 oz. potash and 2 oz. pearlash in 1 qt. water. (3) Add copperas to strong wood ash lye till of the required shade.

STAIN: OIL. Any wood after being oiled becomes much darker in a short time. If the wood is to be also stained or polished, the oil must

be rubbed thoroughly in, and kept free from dust.

STAIN: PAPER OR PARCHMENT. Apply the stain with a broad, soft brush, as though it were varnish.

Green: Dissolve verdigris crystals in vinegar or water.

Orange: Stain first pure yellow, and then brush over a filtered solution of ½ oz. pearlash or salt of tartar in 1 qt. water.

Purple: (1) Tincture of logwood. (2) Archil. (3) The juice of ripe privet berries.

Red: Mix powdered Indian lake in spirits of wine, and leave it for a few days; then strain.

Yellow: Steep 1 oz. powdered turmeric root in 1 pt. spirits of wine. To give a redder tinge, add a very small amount of dragon's-blood.

STAIN: PURPLE. (1) Mix the blue stain and violet stain together till of the required shade. The wood should be afterwards varnished. (2) Boil 1 lb. logwood chips in 3 qts. water for 1 hr., strain and add 4 oz. pearlash and 2 oz. powdered indigo.

STAIN: RED. (1) Mix 1 handful of quicklime and 2 handfuls of wood ash in water, and leave it to steep for ½ hr. Pour off the clear liquid into another pot, and add ½ lb. Brazil wood; let it steep for ½ hr. and then boil. Let it cool a little; pour the liquid into another pot, and add 1 oz. gum-arabic. Boil some alum in soft water. Soak the wood in this, and then dry it. Warm the red stain, and apply as many coats as are required. When dry, polish with a piece of ivory. (2) Boil 1 lb. ground Brazil wood in 3 qts. water for ½ hr., strain, and then add ½ oz. cochineal. Boil again gently for ½ hr., and leave to cool. Apply the stain with a small sponge, and then varnish. (3) Mix Venetian red in linseed oil, and apply it on a flannel pad, rubbing the stain well in. (4) Apply a solution of hypermanganate of potassa. [*See* STAIN (ROSEWOOD: IMITATION: No. 2)]

STAIN: ROSEWOOD, IMITATION. (1) Mix 1 oz. logwood extract in 1 gal. water, and apply. Grain with a black stain or a solution of copperas, using a fine camel-hair brush, or a feather and a tuft of wadding, or a sponge. (2) Apply a concentrated solution of hypermanganate of potassa, and leave it on till the desired tint is obtained; 5 mins. will usually be found sufficient. On cherry the stain gives a rich red tint. (3) First stain mahogany, and then grain with black or copperas solution as No. 1.

STAIN: VENEER. The stain must penetrate right through the veneer. Soak the veneer in a solution of caustic soda for 24 hrs., and then boil for ½ hr. Wash, and then leave it to steep in the stain for 24 hrs. Lime and holly are the best woods for taking stain in veneer.

STAIN: VIOLET. (1) Boil 4 oz. Brazil wood, 8 oz. logwood chips, and 1 oz. alum in 2 qts. water, till all the strength is extracted. (2) Boil 1 lb. logwood chips in 3 qts. water till all the strength is extracted, then add 4 oz. pearlash and 2 oz. indigo, and strain. (3) Mix Dutch turnsole in water, and strain. After the colour is laid on, dilute the stain very much, and wash the wood with it till it becomes bright. (4) Dissolve 8 oz. madder, 4 oz. fustic, 4 oz. dragon's-blood and 1 oz. common soda in 3 pts. methylated spirits. This makes a very dark purple to chocolate stain.

STAIN: VIOLIN. (1) Boil 4 oz. campeachy wood and 1 oz. turmeric root in 1½ lb. water in a copper or earthenware vessel. No iron should come in contact with the stain. (2) Dissolve 1 oz. dragon's-blood in 1 pt. spirits of wine.

STAIN: WALNUT. To make pale, poor walnut appear richer: (1) Steep 4 oz. alkanet root in 1 pt. linseed oil. Rub it well into the wood, and keep it for 12 hrs. free from dust before filling in and polishing. (2) Dissolve 2 oz. asphaltum in 1 pt. turpentine, or wood naptha.

STAIN: WALNUT, IMITATION. Chestnut makes the best imitation walnut, then sycamore, and then lime. (1) Boil ½ oz. washing soda, 2½ oz. vandyke brown and ½ oz. bichromate of potash in 1 qt. water for 10 mins., and then strain. (2) Mix equal parts vandyke brown and burnt umber to a paste with ammonia or ale, and thin to the required consistency with water. (3) Mix 1 lb. burnt umber, 8 oz. rose pink and 8 oz. vandyke brown in 1 gal. strong vinegar. (4) Dissolve 4 oz. asphaltum in 1 pt. turpentine or wood naphtha. If it be desired to bring out the grain still more strongly, give a coat of boiled oil and turpentine.

STAIN: YELLOW. (1) Heat together and mix 3 oz. tallow, ¾ oz. wax and 1 pt. turpentine. This stain is usually applied to oak, rubbing it in well in a warm room. (2) Rub the wood with turmeric, or French berries, or saffron, or merita earth. (3) Mix a small piece of aloes in the varnish that is to be applied.

STAINS: TO REMOVE ACID. If the stain be still wet, sponge it with ammonia; but if it be dry, tie some pearlash up in the stained part; scrape some soap into the soft water, and boil till the stain is removed.

STAINS: TO REMOVE APPLE. Hold the stained cloth over a vessel, and pour boiling water on it slowly, letting the water filter through. If not removed, dissolve a few grains of oxalic acid in ½ pt. soft water, and dip the fabric in two or three times till the stain is removed.

STAINS: TO REMOVE FRUIT. Moisten the cloth, and hold it over a piece of burning sulphur; then wash thoroughly. To remove fruit stains, dyes, blacking, etc., from the hands, mix a few drops of sulphuric acid with the water.

STAINS: TO REMOVE GREASE. *Fabrics:* (1) Sprinkle French chalk on the wrong side of the cloth, and allow it to remain for 24 hrs. Split a visiting-card down the middle, lay the rough side next to the powder, and iron with a warm iron. White blotting-paper or brown paper may be substituted for the split visiting-card. (2) Mix perfectly dry fuller's-earth, lemon juice, and a little pearlash or saleratus, and knead them together till as a thick elastic paste; then expose to the sun to dry. To use, moisten the stain with water, rub it with the ball, wash with water, and dry in the sun. (3) Mix 1 oz. essence of lemon with 3 oz. turpentine, and mix and apply as No. 2. (4) To remove a big splash of thick grease, lay the material on 6 or 8 thicknesses of clean, soft paper, such as newspaper, and dab the stain with a soft cloth and clean lard, frequently changing the place on the paper. Soon only lard will be left on the material, which can be removed in a similar way by dabbing with soap and alcohol. Finally lay the material on a clean cloth, and rub with a soft one to remove the soap and alcohol. 5) Mix the yolk of an egg with a little warm water, and rub it well in with a soft brush. Wash off with warm and then cold water. If necessary repeat when dry. (6) Rub the spot with a flannel dipped in turpentine or ammonia water.

Paper: Cover the paper or parchment with hot pipe-clay, and place under pressure for some hours.

Wood: (1) Mix fuller's-earth and soap lees, and rub the mixture into

the wood; let it dry, and then scour it off with soft soap and sand or hot lees. (2) Pour a little turpentine on the spot, and leave for about 10 mins.; then spread soft soap over it, and leave for a few minutes longer. Pour boiling water on, and scrub with a brush, and wipe dry. If not removed, mix fuller's-earth with the soft soap, and repeat.

STAINS: TO REMOVE INK. *Carpet:* (1) If the stain be fresh, pour milk over the spots, and dry with a sponge; repeat till the milk is not blackened, and then wash away the milk with cold water. (2) If the stain be old, dampen it with dilute oxalic or hydrochloric acid, and dry with white blotting-paper. Care must be taken to wet only the ink, for the acid loosens the dye. If the dye begin to run, rinse in warm water, and then dip it in a solution of 6 drops ammonia to 1 qt. water as quickly as possible.

Cloth: (1) If fresh, wet the place with lemon juice or vinegar, and the best hard white soap, and then rub thoroughly. (2) Saturate with turpentine, and leave for 2 or 3 hrs.; then rub between the hands.

Engravings: Dissolve 1½ oz. washing soda in 4 lb. water. Dissolve ½ oz. chloride of lime in 4 lb. water, and then mix it with the soda solution. Soak the engraving in the mixture for 15 mins.; then wash, and then place it in a solution of 1 part hydrochloric acid to 10 parts water for 15 mins., finally rinse in running water for 15 mins., and dry.

Floors: Scour with sand dampened with hydrochloric acid and water. When removed, rinse with strong pearlash water.

Furniture: (1) Wipe the spots with oxalic acid, and let it stand a few minutes; then rub them with a cloth dampened with warm water. (2) Put a few drops of nitre in a teaspoonful of water, and touch the stains with a feather dipped in this; then rub the spots immediately with a damp cloth.

Hands: Rub the spots with grease or animal oil, and then wash with soap and warm water. If the ink be well ground into the pores, use a little diluted lye and fine sand.

Ivory: Rub the stains out with oxalic acid, and then polish with whiting and oil.

Linen: Immerse the stained portion in boiling tallow, and when cool wash out in soap suds.

Marble: Dissolve ½ oz. butter of antimony and 1 oz. oxalic acid in rain water, and then add sufficient flour to bring it to a paste. Lay it over the stain, and leave for a few days. If necessary repeat.

Paper: (1) Lay a pad of clean, white blotting-paper under the paper behind the stain. Moisten a small sponge in lemon juice, and dab the stain carefully so as to dampen the spot; then make a pad of clean muslin, and dab the wet stain. Repeat this over and over again, shifting the position of the blotting-paper each time, and do not *rub* the lemon juice in. If lemon juice alone fail, add salt, then hydrochloric acid and water, and as a last resource a mixture of a teaspoonful acetic acid with 1 oz. lime water. (2) A fresh ink spot from good paper by rubbing with a mixture of saltpetre, sulphur, alum and pumice powder. If the ink stain be old, first damp it.

Type: Apply wood-ash lye with a brush. If concentrated, put 1 lb. lye to 5 gals. water. If the surface be too uneven for the lye, use ink-eraser.

STAINS: TO REMOVE LIME. Mix 1 tablespoonful ammonia in 1 gal. water, and apply it to the cloth. If wood gets spotted while plastering, allow the stain to dry; then remove it with coarse sand-paper, and polish with fine.

STAINS: TO REMOVE MILDEW. (1) Mix 2 parts soft soap,

2 parts starch, 1 part salt and the juice of a lemon. Lay it on the stain with a brush, and lay the article out on the grass day and night till the stain disappears. (2) Mix 1 teaspoonful lime in 1 qt. water, strain and dip the fabric in. If the stain does not disappear, lay the cloth out in the sun, or dip it a second time. Rinse thoroughly when the mildew is removed. Care should be taken not to make the lime water too strong, or the cloth will be damaged. (3) If the mildew be on muslin, or similar material, wash it in hot chlorine water, or spirits of hartshorn. (4) Apply sour butter-milk and lemon juice, and then rinse. (5) To prevent mildew on large coarse cloths, such as sails, soak the cloths in hot soap suds, press out the excess, and then immerse them in strong alum water, or in a weak lead acetate solution. Rinse, and repeat the soap if necessary.

STAINS: TO REMOVE PARING. To remove stains from paring, rub the hands with the inside of apple or pear parings before using soap.

STAINS: TO REMOVE PICKLING. To remove pickling stains, wash the hands, and dry slightly; then strike a sulphur match, and hold the hands over and around it to catch the fumes.

STAINS: TO REMOVE TAR. To remove tar stains, rub with fresh lemons, orange peel or butter.

STAINS: TO REMOVE TEA. Mix 1 tablespoonful salt in 1 teacupful soft soap; rub it on the spots, and spread the cloth out in the sun. Leave for a few days, occasionally wetting the spots, and then wash. If the spots reappear on washing, repeat the process.

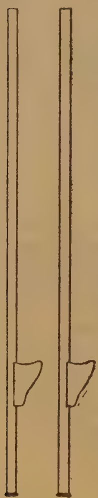
STARCH: CALICO. Make a strong tea of fig leaves, and mix the starch with it. Wash the print in three waters, and rinse in the fig-leaf water. When nearly dry, fold the fabric, and leave for ½ hr.; then iron.

STARCH: POTATO. Wash the potatoes very clean, grate them fine, and wash as much as possible; then strain the whole through fine muslin, using plenty of water. Let the starch settle to the bottom of the vessel until the water becomes clear. Pour off the water gently, and the starch will be found in a solid mass at the bottom. If there be any impurity or slime on the top of the starch, it must be carefully removed. When the starch has been thus cleaned, stir it up in fresh water, let it settle, and then remove any impurity as before. This will usually be sufficient, but it may be necessary to repeat the washing a third time. When the starch is clean, take it out, and make it up into small tablets, about 3 in. square, with the hands, or if it be not stiff enough, pour the starch into cotton bags, and hang them up to drain, and then make into tablets. Set the tablets on clean, dry bricks, and let them remain there till the bricks have absorbed all the moisture. Then place them in the sun in a good draught, when the tablets will fall into crystals. These crystals may be made up into starch in the ordinary way, and will keep well.

STARCH: WHEAT. (1) Soak best quality wheat in water till quite soft; then crush the grains on a smooth, flat board little by little, till they have all burst. When all are crushed, mix the pulp with water to a thick paste, and leave until quite sour. Then wash it in small quantities at a time through a very fine sieve. The starch will strain through with the water, the remaining solid part to be thrown away. Leave the starch for about 12 hrs. to settle as a solid cake at the bottom; carefully remove the

clear water on the top, and any impurities there may be on the surface. Stir the starch up again with water, leave it to settle, decant the clear liquid, and remove impurities as often as necessary. To obtain the crystals, cut up into tablets and dry. [*See* STARCH (POTATO)] (2) Have the wheat ground, but not bolted. Put it to soak in plenty of water, and leave it to ferment. Then put it into thin bags, and squeeze all the milky substance out, so that nothing but the bran remains in the bag. Strain this milky fluid through thick woollen, and then leave it to settle. To purify and crystallize, *see* STARCH (POTATO).

STENCILS. Draw the design on good cartridge paper, or on the oil paper used in a copying letter-press; place it on a sheet of glass, and cut it out. More ties should be left than if the stencil were cut in metal. Finally, if cartridge paper be used, give it a good coating of oil varnish or paraffin wax.



STILTS. Cut the poles from hard wood 1¼ in. square × 6 ft. long, and slightly chamfer the edges. Dress out the foot-piece from sound 1-in. pitch-pine. Make the top of each foot-piece 4½ in. broad, letting the last ½ in. rise up about ⅜ in. to prevent the foot slipping off sideways, and 6 in. deep; and use two screws 2½ to 3 in. long to attach each on to its pole. The bottom of the pole may be shod with a few thicknesses of shoe leather to give a good grip and to lessen the jar. The nails should be driven well in, so that the heads do not touch the ground.

STONE: TO CLEAN. Boil 1 lb. pipe-clay in 3 pts. water and 1 qt. vinegar, and then add a bit of stone blue. Wash the stone with this mixture, and when dry, rub with a dry flannel and a medium brush, and then sweep off the fine dust. [*See also* MARBLE (HOW TO CLEAN)]

STOPPERS: TO REMOVE GLASS. (1) Hold the bottle or decanter by the neck with the left hand, and place the first finger at the back of the stopper. Tap the decanter lightly with a piece of wood, first on one side and then on the other, turning the bottle slowly round. (2) Wind a piece of rough string once round the neck of the bottle. Attach one end of the string to a hook, hold the other end with the left hand pulling the string tight, and with the right hand work the bottle smartly backwards and forwards for a few seconds until the neck of the bottle has become hot. Most probably the stopper will come out, but if not, tap as No. 1. (3) Bind a cloth dipped in boiling water around the neck. Then hit the stopper as No. 1. (4) Put a few drops of oil around the base of the stopper, and set the bottle near a fire. When it gets warm, strike the stopper as in No. 1. (5) Put a few drops of glycerine around the base of the stopper, and leave for a few hours.

STORE VEGETABLES AND FRUIT: TO. The shed should be constructed so as to have a dry atmosphere and a cool, even temperature free from frost; it should be easily ventilated when necessary, by means of a skylight with a shutter in the roof; and a free circulation of air must be ensured round the shed. Make the shelves for storing fruit with strips of chamfered boards nailed on, so that air may circulate round each

individual fruit. If, however, for want of space the fruit has to be stored in mass, it should be picked over periodically, and the unsound ones removed.

Beans: Spread the beans out in a dry room until most of the moisture is evaporated; then store in sacks. If necessary to store in boxes or barrels, they should frequently be changed from one barrel to another, to bring those which were at the bottom on the top to dry.

Cabbages: Set the cabbages in rows upon the ground heads down, and two or three abreast; smooth the leaves, and crowd them tightly without crushing them at the bottom. Cover with soil on each side and at the ends from 4 to 6 in. deep. If the cabbages be quite loose, or unripe, dig a trench as deep as the roots are long. Set the roots in the trench, so that the heads are above ground. Fold the leaves carefully over the hearts; bind them in place with bast, and cover them with soil deep enough to prevent freezing. The cabbages may be taken out as desired from February to May, and they will be well blanched. (2) Strip off the outside leaves, and pack the hearts in barrels, filling up the spaces left with damp, but not wet, chopped straw. Only sound and hard heads should be thus stored.

Celery: (1) On a dry November day dig a trench 9 in. wide, and as deep as the celery is tall, in a dry piece of ground. Dig away the earth from the sides of a row of celery, and take up the plants carefully with as much earth attached to the roots as possible. Set them close together in the trench, and sift in only just enough earth to cover the roots, and make all firm. The leaves should not project more than 2 in. above the top of the trench. Cover the tops lightly with dry leaves, and cover all with two boards nailed together as a roof to shed off rain. After one or two weeks, remove the roof, and pile up leaves and straw about 1 ft. high; press firmly down, but not hard enough to crush the celery, and at the sides place some loose earth, beating it smooth with the shovel to carry off wet, and then replace the board roof. Remove the celery from one end as required, and plug up with straw. (2) Pack a barrel let into the earth [*see* CELLAR (CASK)] with the celery, without any soil. (3) For present use, mix about 3 in. of wet mud in the bottom of a box or barrel. Dig up the celery, keeping as much earth on the roots as possible, and place the plants upright side by side in the mud, as closely as possible. Cover the top with a piece of sacking. The celery thus stored will keep for about a month.

Grapes: (1) To store small quantities of grapes, hang the bunches up in a box laid on its side from hooks, taking care that no two bunches press against each other. Bad fruit should be picked off the bunch immediately. (2) To store larger quantities, suspend a barrel hoop from a hook in the ceiling by three cords. Attach another hoop to the first about 2 ft. lower down with cords, and so on till enough hoops are spaced. Attach the grapes to the hoops by strings. It is an advantage to have the hoops of different sizes. The grapes should be looked over periodically, and the bad ones removed. (3) Pick the grapes into shallow wicker-work baskets, and place them in a well-ventilated loft for two or three weeks. Then pick them over, and remove any bad fruit. Place the bunches in shallow boxes or drawers, two layers deep, with cotton-batting, between and on the top, and keep in a cool place. Dry sawdust or corkdust may be used instead of cotton-batting.

Peaches: Peaches may be kept for several weeks if thoroughly enclosed in fine dry sawdust.

Turnips, Beets, etc.. If stored in a cellar, bank 5 bushels, and then cover with earth. If stored in the open, 10 to 20 bushels may be banked together.

STUCCO. Stucco is made by mixing plaster of Paris with a solution of gelatine or glue instead of water. When the plaster has hardened, moisten the surface, and rub it down with pumice stone till quite smooth. Finally coat the surface with a concentrated solution of gelatine, applying it with a brush, as though it were varnish; when perfectly dry, polish with tripoli on a buffer or pad.

STUMPS: HOW TO BLAST. Bore a 1½-in hole 3 ft. or more deep down the centre of the stump or log. Put in ¼ lb. coarse powder, and then set in one side of the hole a wheat straw filled with fine powder, which should project 1 in., for a fuse. Partly fill the hole with dry sand, and tamp it down thoroughly; repeat two or three times till the hole is filled. Soak a piece of string in saltpetre, take it out, and when dry light it to see if it smoulders when lit, and if so, put it out. Wrap one end of this round the straw, set light to the other end, and withdraw to a place of safety. If the log be on its side, withdraw from it end on.

STUMPS: HOW TO BURN. (1) In autumn bore a hole down the centre of the stump about 18 in. deep, and put in from 10 to 20 oz. saltpetre, depending on the size of the stump. Fill the hole up with water, and then plug it up tight. In the spring take out the plug, and pour in 1 gill to ½ pt. crude petroleum, and ignite it. The stump will then smoulder away entirely. The stump must be moist when the saltpetre is put in. (2) Bore four 1½-in. holes in the top of the stump 8 in. deep, leaning the brace outwards at an angle of 45°. Fill ¾ full with black machine oil, and plug up tight; also pour 1 gill on the top, and let it spread well. In about a week set the stump alight. (3) Pile dry combustible materials round and over the stump, and cover with turf, forming a small kiln. A slight excavation should be made between two large roots, and filled with dry shavings and wood. Set the shavings alight. In a few days, when the turf falls in, the stump will have been consumed.

SUGARING FOR MOTHS. Boil 1 lb. very dark Jamaica sugar or India dabs in ½ pt. beer, and when cold, and just before applying it to the tree, add a wine glassful of rum. Apply the sugaring on rough barked trees with a paint-brush in narrow strips from 3 to 6 ft. from the ground, or dip strips of cotton into the liquid, and pin them in place on the tree trunks. In fields the prominent heads of thistles and flowers should be painted. After about ½ hr., hold the net under the sugaring, and turn a lantern sharply on. Some moths may immediately drop into the net, and those remaining may be gently flicked off into chip boxes or a killing bottle. Moist, sultry nights are the best; moonlight nights are useless.

SUMMER-HOUSE. Strike out a circle on the ground from 6 ft. 6 in. to 8 ft. 6 in. in diameter. Divide the circumference into eight equal parts, and at each point drive in a post made from a young fir tree, about 5 in. diameter at the bottom and about 3½ in. diameter at the top, or if these cannot be obtained, use 4 in. × 4 in. pitch-pine. Before setting in the posts or poles, tar the ends. [*See* GATE-POSTS.] Cut these corner posts off from 6 to 7 ft. from the ground, using a straight-edge and spirit-level. Now

connect the tops with 4 in. × $1\frac{3}{4}$ in. pitch-pine, making half-joints, and pinning through on to the top of each post, as shown in Fig. 1. There are two common methods of building the roof beams: (1) On two opposite posts erect beams 3 in. × 1 in., making a flat inverted V, as shown in Fig. 2, leaving about 1 ft. projecting for eaves. Make all three joints a good fit, and spike firmly together. On the two posts at right angles to these erect two beams slanting one side being opposite to each corner post. Cut eight pieces of wood 3 in. × 1 in. × from 5 to 7 ft. long for the roof beams. Slant one across from a corner post, leaving about 1 ft. projecting for eaves, on to one of the flat sides cut on the top of the centre post, as shown in Fig 4; spike it in place. Repeat on the opposite side, then the two at right angles, and then the four in between, as in No. 1. The centre post may be used as the centre for a table inside, or it may

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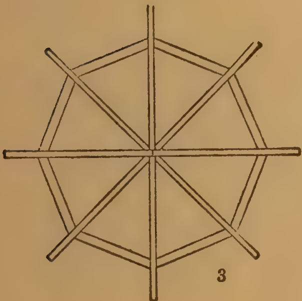

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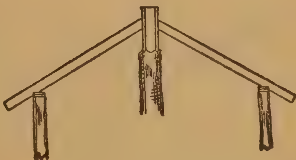

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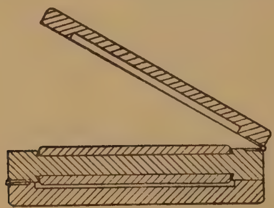
up to the peak already made by the first two roof beams, and terminating with a flush joint against them; spike firmly in place. On the four intermediate posts erect beams to the peak, and one end of each fitting into the corner there; spike firmly in place. This method of jointing is shown in Fig. 3, which is a view looking down on the top of the peak. (2) Drive a post into the ground in the centre of the house, leaving it about 10 ft. above the ground. Cut the top of the pole eight-sided, be cut away a few inches below the roof, and an ornament attached, or a basket of flowers hung from it. The framework is now complete, and the roof may be thatched [*see* ROOFING (THATCH)], or any roofing may be used, but thatching is coolest in summer. Five sides are preferably covered with rustic work, and creepers planted to climb up, or boarded up. Two sides are similarly covered only half-way up, the top being left open for windows; the remaining side being left open for a door. Boarding is preferably

put on horizontally, allowing the corner posts to show on the outside. The floor may be made from 1-in. square boards in eight sections, The boards in each section being about ¼ in. apart, and running parallel to the corresponding side of the house, and getting shorter and shorter towards the centre. Or the floor may be made by covering the earth with 2-in. stones and then 2-in. gravel.

SURFACE PLATE. Cut three pieces of glass 6 in. × 6 in. × ½ in., or larger if desired. Cover the first piece with oil and emery, and rub the second piece over it with a small circular motion. Now rub the second piece on the third with emery and oil in between, and then the third on the first, till any piece will touch either of the others all over. Then polish by filing a



piece of an old oil-stone to powder, and substituting it for the emery. Cement the two best pieces in a frame, such as the one illustrated, with plaster of Paris, having previously bevelled or rounded off the edges. Keep the third piece for rough work, or to reface, when the plates get worn. Good plate glass is a surface plate without being worked at all.

TABLE: SMALL OUTDOOR. (1) Place a weight inside a flour barrel, nail on the cover, and then nail on a 1 in. board 2 ft. × 3 ft. Paint, varnish or cover the table with American cloth. (2) For small circular tables, barrel heads may be used.

TAN SKIN: HOW TO. Bark tanning is a process that belongs to the professional tanner. A few home receipts are given, which will keep the leather strong and flexible, provided it is kept dry. (1) If the fur be greasy, add 1 tablespoonful soda to 3 gals. strong suds, and wash the skin in it. Continue washing the skin in fresh suds till clean. Dissolve 2 oz. alum and 2 oz. salt in 1 pt. boiling water, and when cold put the skin in and leave it for 12 hrs.; then hang it up to drain. When nearly dry, stretch the skin out, and nail it hair side down. Rub in a mixture of equal parts alum and saltpetre till the skin will not take any more, and keep on rubbing it in periodically for 3 hrs. Now take out the nails, and fold it up skin sides together, and hang it up for two or three days, rubbing fresh salt and alum in every day. Then clean away all impurities with a blunt knife; rub the skin down with pumice stone, and comb out the fur. This process is especially suitable for large skins, such as sheep skins. (2) Wash the skin in water, and then scrape it clean with a blunt knife. Mix 2 oz. alum, 1½ oz. salt and 1½ oz. wheat meal with sour milk to form a paste. Rub this paste well into the skin side till the skin will absorb no more; then spread it on as paint, fold the skin up fur side outwards, and place it in a cool place. After about 24 hrs. rub it well in and spread on another layer, and so on, repeating six or seven times once a day. On the third and sixth day the skin should be washed and half-dried. After the last application, wash in running water, drain, and when dry, brush over the skin side with a strong solution of alum in water. Hang up to drain and dry, and

then soften it by pounding it with a wooden mallet, working with the hands, and finally rubbing the skin side with pumice stone. (3) Remove all fat and flesh from the skin, and then wash it in a solution of soda and water. Mix 4 oz. pulverised alum, 8 oz. salt, 1 qt. new milk and 1 pt. prepared starch in 4 gals. soft water. Put in the furs, and air them often by hanging them over a stick laid across the tan tub, so that they will drain back into the tub. After a few days of this treatment, remove the skins, and add ½ teacupful sulphuric acid to the liquor; stir well, and replace the skins. Stir up pretty often for 1 hr., then take them out, wring, and rinse in luke-warm soft water. Hang the skins up in a cool place to dry, and when they begin to turn white, work and stretch them till they become dry. Very large and thick hides should be kept in the liquor three or four days. (4) Boil 2 oz. alum and 2 oz. salt in 1 pt. water. Nail the skin fur side down, and apply the liquid when hand-warm with a flannel pad. Now turn the edges up, and pour some liquid into the middle, so that it is retained. Leave it thus for three or four days, and then hang it up to dry. When nearly dry, keep testing a corner, till on pulling it crossways it comes out white and soft like a kid glove. Then work the skin with the hand, beat it thoroughly, and work it over the back of a chair; when soft, rub over the skin with pumice stone, and brush the fur with a stiff brush. This process is particularly suited for medium-sized skins, such as cats, dogs, or rabbits. (5) Tack down the skin fur downwards, and remove every particle of flesh with a blunt knife. Rub with powdered chalk till no more will adhere, and then sprinkle over it powdered alum plentifully. Take out the nails, roll the skin up into a tight roll, and place it in a dry place. After four or five days shake out the superfluous powder, give the skin a good switching and brush the hair. This process is particularly suitable for small skins, such as rat or mole. (6) To dress skins which have been previously sun dried, and are board hard: Mix 1 lb. alum, 4 oz. salt and ¼ peck bran, and pour over them 1 gal. hot water. Leave the liquor to cool, and when hand-warm sponge the skin side till soft. Now shave and break the inner fibres with a currier's knife. Fold it up skin outside, and sew round the edge with a few stitches. Cover the skin with lard, or rancid butter, rub it well in with the hands, and then place the skin in a vat, and tread it well in with bare feet till quite soft. Remove the skin from the vat, cut the stitches, and scrape the skin. To clean the hair, rub it in sawdust, then shake and beat it with a switch. Finally brush the fur with a light wire, and then a stiff bristle brush. (7) For lashes, etc., thoroughly clean the skin, and then bury it in wet ashes or soft soap for two or three days, until the hairs start. Remove all the hairs, soak and wash thoroughly. Dissolve ½ lb. alum and 1 lb. salt in 4 gals. soft water. Immerse the skins in this for about 12 days, take it out, and work it thoroughly till dry. (8) For leathers, mix quicklime with water, allow it to settle, and pour off the clear liquid. Soak the skins in this lime water for about 10 days, or until the hair can be easily removed; then soak and wash till all the lime is taken out. Mix 4 oz. alum and 8 oz. salt in 4 gals. water, and soak the skins for two or three days in this liquid. Take them out and hang them up to drain. When half dry, rub and work the leather till it becomes dry.

TAR PAINT. (1) Place 3 gals. tar over a slow fire, and after it

has simmered for about ½ hr., mix in a handful of quicklime. Take the paint off the fire, stir in 1 qt. wood naphtha, and apply it hot. (2) Boil 5 lb. gas-tar for 2 or 3 hrs. very gently over a slow fire, and then allow it to cool to about 100° Fahr. Warm up 1 lb. mineral naphtha to 100° Fahr. in a water bath, and mix the two together. It should be remembered that naphtha at that temperature must be kept away from naked lights. (3) Heat and mix 10 gals. coal-tar, 2 lb. tallow, 8 oz. resin, 1-lb. lamp-black and 10 lb. freshly-slaked lime. This varnish applied hot is often used for iron pipes, etc. (4) Warm and mix a little pitch with the gas-tar, and when cool enough, thin with turpentine. (5) Heat and mix 4 lb. coal-tar, 1 lb. resin and 1 lb. asphaltum. Apply cold. [*See also* ROOFING (TAR)]

TARPAULIN. Before applying the waterproof mixture, the material must be thoroughly washed to remove all starch or "wading".

Stretch light materials on frames, slightly damp them, and then apply the mixture as paint. (1) (*a*) Immerse the material loosely in boiled linseed oil, and then hang it up to drain and dry. If necessary, dip it again when the first application is thoroughly dry. (*b*) Immerse the material in double boiled linseed oil coloured with ochre brown or vegetable black. Either (*a*) or (*b*) is a common method for preparing cheap oilskin. (2) Dissolve 1 part gutta-percha in 10 parts benzine, and then pour it over, and mix it with 10 parts linseed oil varnish. This may also be used to cement the material together. (3) Steep the cloth in a solution of 15 parts caoutchouc, 1 part tallow and 1 part slaked lime or pipe-clay. (4) Soften 4 oz. glue, add 2 oz. soap and dissolve it in 1 gal. water. Boil the cloth in this mixture for several hours; wring it out, and hang the cloth up to dry in the air. Dissolve 13 oz. alum and 15 oz. salt in 1 gal. water, and immerse the material in this mixture before it gets dry from the first immersion. Then rinse it in clear water, and hang it up to dry in a room at about 80° Fahr. (5) Immerse the cloth in a solution of 1 part soap in 5 parts water; then in another solution of 1 part copper sulphate in 5 parts water. This dressing is often used for tents, etc. (6) Boil 3 oz. yellow soap in 1 pt. water, and while hot add 2½ lb. yellow ochre, 1 oz. terebine and 3 pts. boiled oil. This preparation is often used for tents, etc. (7) Boil 1 lb. litharge, 1 lb. lampblack and 14 oz. umber in 12 gals. linseed oil for 24 hrs. Apply as a paint in thin coats. This preparation is often used for the awnings over carts, etc. (8) Mix boiled Stockholm tar with whale oil. This preparation is used for very rough and heavy materials, one coat being sufficient.

TATTING: HOW TO WASH. Sew a piece of flannel over a bottle, and wrap the tatting evenly over it, and carefully tack each row. Sew a piece of thin muslin over, leaving it long enough to tie over the top and bottom; sink it in a basin of cold water, and let it soak over night. Cut up white soap into shreds and stew them with the tatting. If the tatting does not seem clean, pat the bottle with the hand, add more soap and stew again. Rinse in cold water, and put to dry near the fire, or in the sun. [*See also* LACE (TO WASH)]

TEMPERING. Take for example a chipping chisel. Polish a portion of it near the cutting edge on a grindstone, or with a piece of emery cloth. Place the bottom half in a coke or wood fire, and leave it there till it is cherry red. Care must be taken not to

let it get white hot, or it may "burn". Take it out, and quickly immerse about the bottom inch in cold water till it is black, leaving a band of red or very hot material an inch or two above. Now quickly rub over the part previously polished with a piece of rotten stone, pumice stone, or scythe stone, till it appears bright. Watch this bright part, and as the heat travels down, it will first turn pale yellow, then darker yellow, then brown, and finally blue. Immediately the dark brown colour appears, immerse the bottom inch in cold water, and leave it in till it has stopped sizzling, then immerse the whole of the chisel and stir it round till it is cold. To temper other tools, immerse them the second time, when the bright part turns to the correct colour. A table is appended with the different colours for the different tools, the temperature corresponding to that colour, and the alloy which melts at that temperature. It will be obvious that it is only the last ½ in. or so of the tool which is at the proper degree of hardness, and when that is worn or broken off, the tool must be tempered again. To temper a number of small articles, or larger articles to the same hardness all over, place all into an iron box in a hollow fire; make all cherry red, and then plunge the box and its contents into cold water. Grind a patch on the end of each of them, and place them on a red-hot bar of iron. When the bright patch turns the correct colour, flick the article off into a pail of water. To temper taps, dies, rimers, etc., slightly heat in a gas flame, and smear all over with a mixture of lampblack and Castile soap. Fill up a piece of gas barrel with the tools end on; sift charcoal dust to fill up all interstices, and cover the ends up with clay.

Colour.	Purpose.	Temperature. Fahr.	Alloy whose fusing-point is at the same temperature. Tin.	Lead.
Light straw	Turning tools for metal	430°	1	1¾
Dark straw	Wood tool, rimers, etc.	470°	1	2
Brown-yellow	Chipping chisels, hatchets, etc.	500°	1	4¾
Dark purple	Springs, etc.	550°	1	12

Place in a fire till all is a cherry red, then knock off the clay from one end and let the tools drop *end on* into a solution of chloride of sodium and nitrate of iron in water at a temperature about 60° Fahr., and leave them in for 20 mins. After being made glass hard, the tools may be tempered on hot iron, as explained before. To temper spiral springs, put them in a gas barrel of just a working fit; heat the whole to cherry red, and then drop it into sperm oil *end on*. When cold take the springs out, and hold them with a pair of tongs over a flame till the oil burns; then plunge them into cold water. The amount of oil to be

burnt off depends on the size of the spring, and the desired temper. If all the oil be burnt off, the spring will most probably be too soft; if none be burnt off, too hard. Sometimes the spring with the oil burning on it is plunged into a tub of cold water with a layer of oil floating on the top. If rings or patches of hard metal be required, bind wet clay over the parts which are to remain soft with steel wire, and then heat very quickly. Plunge into cold water, and temper as before. The clay rings or patches must not of course be too small or narrow. To temper small tools exactly, make up an alloy from the table given. Drive the tool into it when cold; then heat the tool to cherry red, and plunge it into the impression. This method is more particularly suited for small tools. To temper watchmakers' tools, heat them to cherry red and plunge them into sealing-wax; take them out, and plunge into another place, and so on over and over again till cold. Very small tools may be heated cherry red, and then whirled round in the air till cold. To make steel very hard indeed for cutting glass, plunge the steel at a cherry red into mercury or a freezing mixture. If the steel be bright, and it be desired that it remain so, coat the surface with common soap.

TENNIS-COURT. If the court is to be made of cinders or asphalt, make it a very little higher in the middle than at the sides for the water to run off. Leave at least 8 yds. longer lengthways, and 3 yds. broader sideways than the bare measurements of the court.

Asphalt: (1) Dig down 5 in., ram the earth down at the bottom, and then fill in 6 in. of concrete, made from 5 parts clean gravel or shingle and 1 part blue lias lime, and ram it down thoroughly. Then place a layer 1 in. thick of best asphalt on the top, and sprinkle Derbyshire spar or grault over the surface, and roll. (2) Dig down 4 to 6 in., and fill up with rough stones and bricks, which should pass through a 1½ in. sieve, and ram down thoroughly. Then stir up hot boiled tar with gravel, and ram down a layer 2 in. thick. Leave for three or four months to find soft or sunk places; then put a layer of best asphalt 1 in. thick on top, and sprinkle with Derbyshire spar or grault, and roll.

Cinder: Dig down 3 in. and ram the bottom quite flat. Fill up with 3 in. broken stones or bricks to pass through a 1½ in. sieve, and ram down thoroughly. Then place a layer 1½ in. thick of dry breeze or ashes on the top, and roll down well.

Concrete: (1) Dig down 6 in. and ram the bottom of the excavation. Fill up with 6 in. concrete made from 5 parts clean gravel or shingle and 1 part blue lias lime. When set, boil gas-tar, dry clean sand and a little lias lime, and spread and level it 1 in. deep on the top of the concrete while hot. (2) Dig down 4 to 6 in. and ram the bottom of the excavation. Fill up with rough concrete, or broken stones and bricks, which have been passed through a 1½-in. sieve. Mix 1 part cement to 3 parts clean sand, and lay it 2 in. deep on the top of the concrete. Finally lay ½ in. of pure cement over all.

Gravel: Dig down 3 or 4 in., and ram the bottom of the excavation. Fill up with broken bricks and stones, which have passed through a 1½-in. sieve. Then place a layer 1½ in. thick of gravel, and roll well down. The gravel may have salt strewed over it, and be well rolled in to prevent weeds growing.

TERRA-COTTA: TO REPAIR. If a terra-cotta ornament be broken, and a piece missing, gum stiff paper on to the inside

to form a mould. Mix clay of the same colour, or pipe-clay coloured with the necessary pigments, with glue and alum water, and mould in place over the paper. This paste may also be used as a cement.

TETHER. Cut two light poles of pine 8 to 10 ft. long, and connect them at the centre with a few chain links; the centre link should be fitted with a swivel. At one end a large ring is slipped over a stake driven into the ground, and on the other end is a small ring to which the animal is attached. A tethering screw, which may be used instead of the stake, is made from a piece of ⅝-in. iron bent as a corkscrew, with an eye-hole at the top.

THERMOMETER. If the mercury be separated or broken up in the tube, heat the thermometer till the mercury has risen up, and all is united; then allow it to cool.

TINNING. If the metal to be tinned be new, wash it till perfectly clean with hydrochloric acid, water and ashes, and then rinse it in running water. If the metal be very greasy, or an old pot is to be retinned, clean it by one of the two following methods: (*a*) Dissolve 1 part caustic soda in 10 parts water; immerse the article, and rub all over it with tow on the end of a stick. Then rinse it in running water, then in the caustic soda solution, and rinse again. Finally dip the article in nitric acid and water alternately two or three times, till perfectly clean, and dry in sawdust. (*b*) Heat the metal and burn off all the fat and grease, but care must be taken not to make the metal too hot, or it will be softened, and will then have to be made hard again by hammering. When cool dip the metal in hydrochloric acid; rinse, and dry in sawdust. The metal being cleaned, tin by one of the following: (1) Cover the outside of the pot, or the part of the article which is not to be tinned, with a mixture of whiting, salt and water. Rinse over the part to be tinned with killed spirit [*see* SOLDER FLUXES], and then sprinkle finely-ground sal-ammoniac over it. Hold the article over a fire, and press a stick of pure tin in the middle. When it melts, wipe round with a woollen pad all over the parts to be tinned, and remove any tin that is over with this pad. Then immerse immediately in cold water, and scour over every part with sand and water. Dry in sawdust, and polish with whiting or some suitable polish. This and similar methods, only varying in detail, are employed commercially. (2) Boil the article for ½ hr. in a mixture of 3 lb. cream of tartar and 4 lb. tin shavings in 2 gals. water. Caustic soda or stannate of potassa may be substituted for the cream of tartar. (3) Boil 14 oz. bitartrate of potassa and 1 oz. protochloride of tin in 20 oz. water for a few minutes, then put the brass in contact with a zinc plate, and immerse both in the liquid. (4) Mix 1 lb. ammonia alum and 1 oz. protochloride of tin in 12½ lb. boiling water. [*See also* ELECTRO-PLATE]

TIN-PLATE: HOW TO FROST. (1) Dissolve 1 part common salt in 2 parts soft water, and add 4 parts nitric acid. Place the tin-plate over steaming water, and rub the liquid on the bottom side. When sufficiently frosted, rinse, dry in non-resinous sawdust, and then lacquer. (2) Heat the tin-plate till just too hot to hold in the hand, and then immerse it in a

solution of 1 part hydrochloric acid in 4 parts water. Rinse, dry in non-resinous sawdust, and lacquer.

TINWARE: HOW TO CLEAN. (1) Wash the tinware in hot suds with a woollen cloth. If this be not successful, rub over with a mixture of kerosene and powdered lime, or whiting, or wood ashes, but do not use lye. (2) Rub flour over the tinware with newspaper.

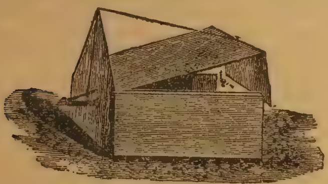
TRACK: HALF-MILE RUNNING. Mark out two parallel lines each 600 ft. long and 451 ft. 3 in. apart. Joint up the two pairs of ends, making sure that these cross lines lie at right angles to the main lines. Divide these cross lines in the centre, *i.e.*, 225 ft. 7½ in. from either of the main lines. At these points drive in pegs, and with a piece of wire 225 ft. 7½ in. long mark off a semicircle at each end, joining the two main lines. Mark this curve with posts or lime. At a distance of 3 ft. outside this line the perimeter will be exactly ½ mile. It is well to mark out the home stretch 60 ft. wide, the remainder of the course being 45 ft. wide.

TRANSPARENCY: ENGRAVED. Wash the glass with water in which a little soda has been dissolved, dry and apply two coats of dammar varnish. When these are dry, apply a third coat, and when it is nearly dry and is "tacky" it is ready for the engraving. This should be laid between the folds of a towel dampened with salt water until it is thoroughly moist. Then place it face downwards on the tacky varnish, and with a pad press and work it till every air-bubble is expelled. When the varnish has become perfectly dry, moisten the finger in clean water and commence rubbing off the white paper, rolling off the minute pellets as they are formed. As the engraving is approached, great care must be exercised not to rub off the ink which is sticking to the varnish. Dry thoroughly, and if any white spots or dim places appear, moisten the finger and remove them as before. If it be required to tint the transparency, apply a coat of varnish, and lay a thin coat of glass on while still wet. Paint on this glass and shade as if painting a magic lantern slide [*see* MAGIC LANTERN SLIDES], then varnish, and if necessary lay on a second pane of glass, paint and varnish again; then a third sheet, and so on. This process gives a remarkably solid resemblance to the picture. The more common and less troublesome method is merely to paint on the back and varnish.

TRANSPARENCY: STATUESQUE. Cut a pane of ground glass to the required size, and trace off the design of some statuary figure on it. Now shade the figure, using pencils from BBB to H, and an artist's stump. Rub down all sharp outlines in the shading, blending them with the stump. The print must be accurately copied, and the high lights and deep shadows put in last, the former with mastic varnish, and the latter with black crayon. When the figure has been thus satisfactorily finished, the entire background must be filled in with opaque black. The black may be made by rubbing up lampblack and varnish, or tube paint. When it is desired to colour the transparencies, mix good water-colour paint with dammar varnish, and apply on the wrong side with a paint-brush.

TRAP: BEETLE. Place a conical, smooth-glass, office gas-shade, small end downwards, in a jar, so that it rests on the rim. Place beer and treacle in the bottom of the jar, and incline pieces of wood from the floor to the shade for ladders. The beetles ascend the sticks, and then slip down the glass-shade through the hole into the jar.

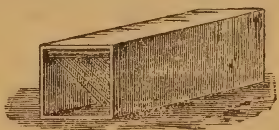
TRAP: BOX. Cut from ¾-in. deal one piece 15 in. long × 8 in. wide for the bottom; two pieces 15 in. long × 7 in. wide for the sides; and one piece 18 in. long × 9 in. wide for the end. Nail the two side pieces to the bottom, and then nail on the back. After the back is fixed, bevel its two sides to a gable, as shown in the illustration, and in the peak cut a notch for string. Cut the top and front pieces so that they make a good but easy working fit. Round the back edges of the top piece so that it will close easily when hinged. To hinge, bore a small hole ⅜ in. from the top, and ½ in. from the back of each side piece, and drive wires into the top through these holes. In the centre of the end



piece, 3½ in. from the bottom, bore a ½-in. hole. Cut a piece of ash or hazel twig 10 in. long by about ⅜ in. diameter, and drive a piece of wire 1 in. long through the centre at right angles to the twig, so that it projects about ¼ in. on each side. Near the end cut a notch for the catch, as shown in the illustration. About 3 in. above the hole in the end piece cut a notch for the other end of the catch to rest in. Now make the catch the right length to reach from notch to notch, when the wire driven through the spindle presses against the inside of the end piece. Drive a nail into the front end of the top piece; tie one end of a piece of string to it, and tie the other end on to the catch, passing it over the notch cut in the top of the end piece. To set the trap, bait the spindle, pass the notched end of the spindle through the hole from the inside, and nip the catch lightly between the two notches.

TRAP: HOW TO DISINFECT. Traps should be handled as little as possible; it is best to pick them up with long wooden tongs, the jaws of which are never touched. After an animal has been caught in a gin or noose trap, it should be disinfected by dipping it in fresh blood or melted beeswax and then rinsing it in water, or by smoking it.

TRAP: DROP-DOOR. Make a box 3 ft. long × 6 to 8 in. wide × 6 to 8 in. high. Leave the two ends open, and fit a roller stick into each end close up to the top; bore holes in it with a gimlet, and then fix wires into the holes so that



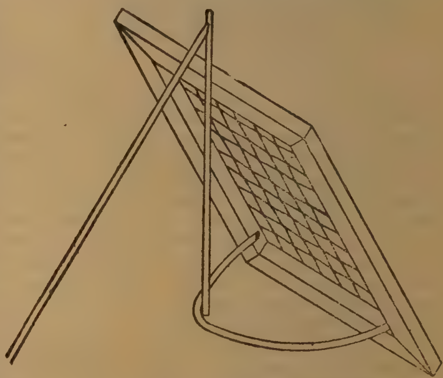
they will rest at an angle of 45 degs. as shown in the illustration. Wind the roller stick with wire to prevent it being gnawed through. The animal lifts the door when going in, and it closes to by its own weight.

TRAP: FIGURE-FOUR. The illustration of the method of the

way the sticks are cut and fitted together explains itself. The board or box is rested on the slanting stick, and the baited end projects under the board. Nearly every trap is a variation of this mechanism, or the one described under TRAP (BOX). Where a board falls directly on the ground, the ground must be hollowed out under the bait, so that the animal is caught, but not injured.

TRAP: GIN. Gin traps should be used for very shy animals and birds. The bait should be placed near the pan for animals, so that they put their feet on the pan; for birds the pan itself should be baited, so that the bird is caught by the neck. Attach a weight to the tail of the trap, but do not fix it to a tree or rock, for animals will often pull the leg off if they have something rigid to work against. Cover the trap with earth, and sprinkle it on with a spade, standing as far away from the bait and trap as possible. Then obliterate all footmarks. When aquatic animals are to be trapped, attach the gin with a chain and ring slipped over a sliding pole. Cut a pole, with two branches opposite each other, a little longer than the water is deep. Cut off the branches about 4 in. long, and a little above them drive firmly in two screws on opposite sides, and slanting towards the end of the pole. File the counter-sink off the upper parts of the screws, so that if the ring attached to the trap is allowed to drop down the pole, it will pass over the screws, but will be stopped, and rest on the branches. Now plant the pole, branch end down, in the bed of the river, and attach the gin to it. Immediately the animal is caught it will dive into the water, the ring will slip over the screws, but when the animal wishes to rise again, the ring will catch in the screws, and it will thus be drowned. The branches will be the means of drawing the trap and game from the bed of the stream. It is often desirable to place small animals caught in a gin trap beyond the reach of other hungry quadrupeds. Bend the top of a young sapling down to the ground; fasten one end of a chain on to the trap, the other end on to the sapling. Place the end of the sapling under a catch previously prepared, by driving a stick with a projection on it firmly into the ground. Make the catch just sufficient to hold the sapling when everything is still. When the animal struggles it will free the catch, and the sapling will spring up, carrying the trap and animal with it.

TRAP: HALF-HOOP. Make a frame from ¾-in. deal about 18 in.



by 12 in., and cover it with wire. Cut a piece of ash or hazel 24 in. long, and bend it into a half-hoop, as shown in the illustration; the spring in the wood will keep it in

position when the other two sticks are set. Cut another stick 19 in. long, and make two notches on opposite sides of it, 1 in. and 4 in. from the end. The back stick, which should be about 20 in. long, fits into the top notch, the top of the frame into the lower one. Catch the other end of this stick in the half-hoop, as shown in the illustration. Place the bread or grain on the ground inside the half-hoop. The bird will alight on the half-hoop, and thus spring the trap.

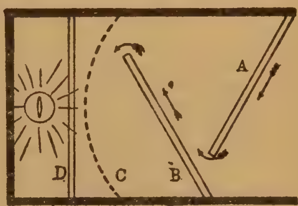
TRAP: INSECT. After sunset place a barrel among the fruit trees, tar the inside, and place a light in the bottom.

TRAP: LINE. Attach nooses made of horse-hair or fishing-gut to a main string, as shown in the illustration. Strew grain over the nooses, and watch the trap. Immediately a bird catches its foot in the noose, relieve it from the noose, or it most probably will free itself.

TRAP: MINNOW. Cut the bottom off a large pickle jar, and cover the hole thus made with coarse gauze, tying it firmly round the outside. Sew a few threads of wool about 2 in. long to the gauze on the inside of the jar. Attach a long string to the neck to lift out and lower the jar into the water. Place the jar on the bed of the stream, so that the water will flow through the gauze and out of the mouth. The water thus flowing will agitate the red threads, the minnows will enter at the mouth, mistaking them for worms, and when a sufficient number are in the jar, it should be raised quickly.

TRAP: MOLE. Drive some nails through a heavy board, or weight the board with bricks, and file them sharp. Set the trap with a figure 4 [*see* TRAP (FIGURE FOUR)], so that when the trap is sprung the nails will pierce through into the mole run. The spindle of the figure 4 should set close down to the trail, so that the mole in passing under it will spring the trap.

TRAP: MOTH. A plan is shown of the trap with the top removed. Make a box 18 in. long × 9 in. wide × 9 in. high, with a movable top, and one end left open. (A), (B) and (D) are sheets of glass. A lamp is placed between the back and the last sheet of glass (D), and a hole is cut above it in the top for the chimney. (C) is a piece of gauze to prevent the insects damaging themselves. The moths will try to get to the light, and will flutter along the slants of the glass,

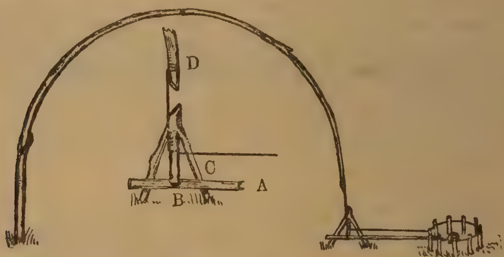


as indicated by the arrows; when they have once got to the gauze, they will never find the way out again.

TRAP: MOUSE. Cut a thin piece of wood 2 in. long × 1 in. wide, and then cut it to a point at one end, making it almost a triangle. Bait the point, and rest the edge of an inverted bowl on the top edge of the wood, the baited end pointing

towards the centre of the bowl. The slightest touch should knock the wood on to its side, and let the bowl drop.

TRAP: RABBIT. Rabbits have a very keen sense of smell, and will not touch food that has been handled. The snares should be set as much as possible with a stick held in the hand, and they should not be used a second time after a rabbit has been caught in them without first disinfecting them. [*See* TRAP (HOW TO DISINFECT)] They should be placed in hedges over a run, and this run should not be trodden upon. After setting the traps, walk round the hedge and spit on all the runs over which there are no snares set; this will prevent the rabbits using those runs, and force them to use the others. (1) Make a slip-knot noose at one end of a piece of twine 2 ft. long. Tie the other end to an elastic rod stuck firmly into the ground, or a sapling. At the point where the top of the rod or young tree will reach the earth when bent down in a semicircle, drive both arms of a crotched stick (C) into the ground. About 3 in. away from the crotch drive in a 5-in. circle of sticks ½ in. apart, and cut the top inch of them smooth. Cut a spindle (A) long enough to reach from across the crotch to the centre of the circle of sticks. Cut a catch stick (B) like the one described in TRAP (BOX), and fasten it on to the twine 3 or 4 in. from the end of the sapling. To set the trap, bend the sapling down into position, and hold it there under the arm; place the baited spindle across the opening of the crotch, the baited end being in the centre of the circle of sticks; slip the catch stick through from the opposite side of the crotch, placing one end in the angle of the crotch, the other end pressing the spindle against the two arms of the crotch; loosen the sapling, and the tension on the twine will keep the catch stick and spindle in place. Now lay the noose over the circle of sticks, draw it up so that it rests near the



tops, entirely above the spindle. The rabbit must put its head over the sticks, and thus through the noose to reach the bait. The detailed sketch shows the trap badly set, for it would take a considerable amount of working to force the spindle (A) below the bottom end of the catch (B); but it is so drawn to make the relative positions of the sticks clear. (2) Hang a noose as shown in the illustration over

a rabbit run, taking care to fix it very firmly. Carefully observe the

general directions given at the beginning.

TRAP: RAT. (1) Bore a fairly deep hole in the ground, remove all excavated earth, and make the spot have the same appearance as before. Place a ring of corn around the hole. (2) Cover the top of a barrel with tightly-stretched brown paper; then cut a cross in the centre of it, so that a rat will fall through, and the paper will then spring back again, having a solid appearance. Slant a piece of wood up to the top of the barrel, scatter grain up the board, and glue some on to the brown paper. The barrel should be filled with a few inches of water, and a brick not quite immersed placed in the centre. (3) Cut a barrel head a little smaller than the barrel, and pivot it in place. If it does not balance, nail weights on to the other side. The head must be so arranged that it will tilt round when a rat is on it; drop the rat into the barrel, and then rotate back to its original position. For the rest arrange as No. 2.

TREES: BROKEN BRANCHES ON. Hold the branch in its original position, and then bind it up, using wax [*see* GRAFTING WAX]; put on splints, and tie all up tightly. If the branch be small, adhesive plaster may be used; the heat of the hand is sufficient to make it stick. If the limb is best removed apply white-lead paint plentifully to the cut immediately it is made.

TREES: GIRDLED. When a tree has been girdled by rats and mice during the winter, cut away the edges of the wound in the spring. When a new healthy bark is seen, peel off strips of bark from the limb of the tree, cut them to fit the gap exactly, and bind them in place with a bandage and grafting wax.

TREES: HOW TO PROTECT. Drive in three or four posts round the tree, so that they project at least 6 ft. above the ground, and nail on cross-pieces at the top. Then wind a piece of wire outside, like a screw, with a 10-in. pitch, *i.e.*, each time a complete revolution is made the wire will be 10 in. lower than it was before.

TREES: HOW TO REPLACE. Dig out all the roots of the dead tree with the earth attached to them; fill up with fresh earth, and then plant the new one.

TREES: ROOT GROWN. This is the reverse process to layering. Dig about 10 ft. off some old tree, and when a small root is struck turn the end up above the earth. When this has sent up shoots for a year, detach it and replant.

TREES SPLITTING: TO PREVENT. Select two limbs in a suitable position, and unite them with a splice or tongue graft. [*See* GRAFTING (*Splice*)] The limbs should be temporarily tied together with string, until the graft has set. More bonds may be made in case of one failing. In large old trees, or those whose limbs have already begun to separate, bore a hole through each section, and secure with an iron bolt. The limb should not be fastened with external rings.

TREES: TO TRANSPLANT. Before digging up mark which side of the tree faces north. Replant the tree so that this side faces the north as before. If the tree be fairly large, dig about the tree at a time when the ground is wet, and it has begun to freeze. Leave a large ball of earth about the roots, which will then harden with the cold. After digging well under the tree, prise it over with levers. Take the unfrozen soil thrown from the hole dug to receive the tree to pack around the roots

after resetting. If the soil be not so good where the tree is to be set as that from which it was taken, a waggon load of good soil should be provided. The tree should be stayed with wires running from near the top to stakes driven into the ground.

TREES: WOUNDS ON. Heat grafting wax [*see* GRAFTING WAX], dip a strip of muslin in it, and place it perpendicularly over the wound while it is fresh. Then put three or more narrow bands around the tree.

TRIPLE-TREE. Two illustrations for triple-trees are given, which explain themselves. In Fig. 1, if the double-tree be

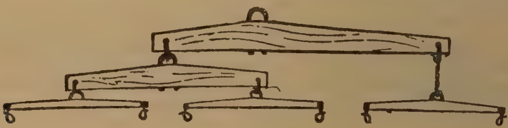


FIG 1.

2 in. × $4\frac{1}{2}$ in. at the centre, make the triple-tree 2 in. × $6\frac{1}{2}$ in. at the centre, 2 in. × $4\frac{1}{2}$ in. at the short end, and 2 in. × $3\frac{1}{2}$ in. at the long end. Lay down

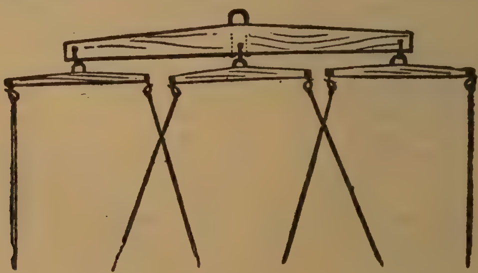


FIG. 2.

the whipple-trees on the floor, and mark out the size of the double-tree and whipple-tree; then the positions for the clevises. In Fig. 2 the triple-tree should be 2 in. × $6\frac{3}{4}$ in. at the centre, and 2 in. × $3\frac{1}{2}$ in. at the ends. In hitching on the horses, place the tallest in the centre, and cross the traces as shown in the illustration. Triple-trees should be finished in the same way as double-trees.

TROUGH: HOLLOW LOG. Select a hollow log of suitable size, and smooth out the inside with a gouge. Saw off the ends square, and nail on end pieces as in TROUGH (PIG).

TROUGH: PIG. Nail two 1-in. boards together V-shape, only not so steep; one board should be 1 in. broader than the other, so that the top of the trough is level. Saw the ends off square to the required length. Saw off two 1-in. boards 15 to 18 in. long, and equal to the narrowest side board in breadth, for end pieces. Nail them firmly on, and if there be any leakage, fill the hole up with cement. [*See* CEMENT (CASK)] When the cement is set, soak the trough in oatmeal and water to stop up all small cracks.

TROUGH: SCALDING. (1) Make the trough from 6 to 8 ft. long × 2 ft. 6 in. wide at top and 2 ft. 3 in. wide at bottom by about 2 ft. 6 in. deep. The sides and ends to be made from 2 in. boards, and the ends grooved ½ in. into the sides. Nail them firmly in place, and further secure them by two iron rods at each end, which should be bolted on to small iron strips traversing the ends of the side pieces. The bottom should be made of ¼-in. iron, lapped over at least 1 in., and securely screwed to the outside of the sides and ends. Plug up all the way round between the bottom of the side and the ends and the iron plate with cement. [*See* CEMENT (IRON)] Fasten two small iron chains by staples to the sides of the trough about 2 or 3 ft. apart. When in use these can be dropped in and over the trough, and by them a hog can be readily turned or lifted. Set the trough on a cheap brick furnace, or a small ditch may be dug underneath for the fire. (2) Make the trough to the same dimensions as No. 1, only nail on a bottom made of 2 in. pine, instead of ¼ in. iron. Fit a good-sized iron kettle into the bottom, making a water-tight joint; set bricks on the under side, where it projects, in the usual way to form a fire-box. Turn a piece of pine to fit the inside of the kettle. When the water is hot enough, place the pine block in the kettle, and lower the hog on to the top. The block will be pressed into the kettle, and the water will flow out, surrounding the hog. Immediately the hog is raised, the block will float, and the water will flow back into the kettle.

TROUGH: WATERING. Watering troughs should be made of 2-in. boards. The sides and ends should be matched into grooves, and cemented with white lead ground in linseed oil. Cover the whole of the top excepting 1 ft. at one end, and leave a trap door for that. The trough may be covered with sawdust in winter to prevent the water freezing.

TRUCK: BARN. Frame two pieces of 3 in. × 3 in. × 3 ft. scantling together with three pieces of 2 in. × 2 in. × 2 ft. with tenon joints, so as to form a platform 3 ft. long × 2 ft. wide. Fit

good brass casters with large wheels to the bottom, as shown in the illustration. This will be found useful for moving grain, vegetables, etc.

TYRES: PNEUMATIC, BANDS ON. Bands are most useful on, and can be best attached to tyres which have a smooth tread. Wash off all mud from the tyre, and sand-paper the tread, and also the inside of the band. Cover both liberally with solution and allow them both to dry. Then solution both again, and while fairly wet, place the band on, press it down and allow it to dry. The tyre should not be used the same day.

TYRES: PNEUMATIC, DOUBLE TUBE, TO REPAIR. *Bursts:* If a large piece be blown out of the inner tube, cut out a short length including the defective part, and let in a piece from another tube in the same way as a leaky joint is repaired as explained under *Punctures*. To repair the cover, solution a piece of prepared canvas on to the inside, and leave enough projecting to get nipped between the edges of the cover and the rim when the tyre is blown up. The canvas should be at least three times the length of the gash, and

slightly broader than the cover. All cuts in the rubber of the cover should be repaired. If it be a slight cut, wash out all dirt, dry, and then solution it up. If the cut be larger, plug it up with a paste made of cotton-wool and solution. If the cut be very bad, a piece of rubber should be cut away from the canvas and a new piece solutioned in. To avoid bursts, repair cuts in the rubber immediately, for if not repaired, water will get in, the canvas backing will rot, and the tyre will eventually burst. Avoid leaving the cycle standing in the sun if the tyres be blown up tight, more especially if they have been pumped up in a cool place.

Punctures: If the tyre be found down, tighten up the valve, and pump. If it still runs down, first examine the valve, before detaching the cover. Fill a wine-glass with water, rotate the wheel till the valve is on the top, hanging downwards, and immerse it in the water. If any air-bubbles be formed, unscrew the valve and thoroughly clean it; also if it be of the rubber type, examine it to see if a new rubber sleeve be necessary. To make the rubber slip on more readily, dip it in water, or sprinkle a little French chalk from the repairing outfit on the inside, and also a little on the valve stem. To locate the puncture, if no air escape from the valve, look on the cover and feel for any projecting flint or thorn. If none be found, inflate the tyre again and revolve it slowly near the cheek or tongue, when the escaping air may often be felt. Another way is to squeeze all the air out, puff in tobacco smoke, and pump up, when the escaping smoke may often be seen. If these methods fail, detach one side of the cover, and without shifting the relative positions of the air-tube and cover, feel on the canvas side of the cover for any projections. If found, the puncture will be exactly underneath in the air-tube. If nothing can be felt, slip out the air-tube and inflate it; then immerse it in a basin of water and stretch it slightly, a little at a time, till a line of small bubbles are seen rising from the puncture. Instead of immersing it in water, it may be painted with soapy or sugar water, when a bubble will be formed over the puncture. Long nails, thorns, etc., often penetrate both walls of the tube, so note if the farther side of the air-tube be punctured as well. If no bubbles can be seen, examine the joint of the tube to see if minute bubbles are formed there. Assuming that the puncture be now located, dry the tube if it be wet. Remove all the gray deposit of sulphur for about ½ in. all round the puncture with sand-paper, or by rubbing with the dampened head of a "strike anywhere" match, or a blunt knife, or by rubbing briskly with a wet handkerchief. Select or cut a rubber patch of a suitable size, and cover one side of it and also the cleaned portion round the puncture with solution. Wait a few minutes till the solution is almost dry and has become "tacky"; then press the patch carefully on, the two solutioned surfaces together; dust a little French chalk over it, replace the tyre and pump up immediately. If no patching rubber be at hand, a temporary repair may be made by gumming several thicknesses of stamp paper over the hole. If the joint be leaking, apply a little turpentine or benzine or benzoline and as it dissolves the old solution roll the rubber back on itself. When separate, clean both surfaces thoroughly and cover them with solution. When tacky, unfold the outside end, so that it comes over the inside end, and press the two together.

Valves: If there be a leak at the

junction of the valve and the tube, try tightening the hexagon nut, which screws down on to the small plate. If the leak still continue, the valve must be taken out and inserted in some other place. Slack off the nut and remove the oval plate; moisten the canvas patch which surrounds the valve stem with turps, benzine or benzoline, and in a short time it can be pulled off. The valve head can now be pulled through the hole in the air-tube. If the rubber be damaged, and the valve has to be inserted in some other place, the piece of the tube containing the defective part is best cut out and a new short length inserted in the same way as repairing the joint in the inner tube, as already explained; but if canvas-backed rubber be used, a large patch may be put on. Cut a slit in the air-tube, just large enough to insert the valve head at the bottom of the stem sideways when the rubber is stretched. Clean off the sulphur round the edges on the rubber; lubricate the valve head with solution, and press it through the hole. Cut an oval piece of canvas 2 to 2½ in. long, and cut a hole out of the centre of it for the valve stem to pass through. Solution one side of the canvas and all round the slit, and when it gets tacky press it well down. Put on the oval plate and screw it down with the hexagon nut. Do not replace the tyre for a few hours.

TYRES: PNEUMATIC, SINGLE TUBE, TO REPAIR. It is almost impossible to make a permanent repair of a large gash on a single tube tyre without a vulcaniser, which costs about 20s., and can only be used at home. If the puncture be small, such as that made by a small sharp flint, deflate the tyre till it is soft, but still retains its form. Clean the tread near the puncture with sand-paper, and then apply solution liberally, and leave it to get tacky. Attach one end of a piece of vulcanised tape to a spoke, and having covered the part of the tape which will come next to the rubber with solution, wind it round the tyre over the puncture, and finish off on another spoke. The tyre should be now slightly compressed at this point, but on the tyre being inflated again the tape will stretch, so that the tyre resumes its original form. Ordinary tape, which is first covered with solution and allowed to dry, may be substituted for the vulcanised tape, but it is not so good. If the puncture be very small, squirt a little solution in, so that a drop forms on the inside, and after waiting a minute or so pump the tyre up. If the puncture be of a medium size, such as that made by a tack, repair with rubber cord about ⅛ in. diameter. This thread should be first smeared with solution, and then forced in with a piece of wire, or with a special repairing instrument. If necessary, the hole may be made smooth and round by forcing a piece of hot wire through, but this requires care. Only thin wire should be used, and withdrawn immediately, only inserting about ½ in. If the wire be pressed in too far, the farther wall of the tyre will be damaged. If the puncture be a fairly large cut, cover the cutter head of the special cutter provided with solution; press it through the hole, and then screw down the fly-nut or handle to cut out the small circular hole. Smear the head of one of the mushroom rubber plugs with solution, and force it in head first. After a few minutes pump up the tyre till it assumes its normal shape, and then cut off the stalk of the plug level with the outside. It is also best to bind the tyre with vulcanised tape, as in the case of a small puncture, but not quite so tightly, or the plug

may be pressed inwards, and thus prevent the repair from being airtight.

VARNISH. Use a soft flat brush from 1½ to 2 in. wide. To clean the brush, wipe it as dry as possible, wet it in methylated spirits, and then wipe it until dry. Lay it away in a clean dry place. Do *not* use turpentine instead of methylated spirits to clean the brush. Before applying the varnish wipe the surface clean with a wet cloth, and allow it to dry. All greasy places should be cleaned with a weak solution of saleratus. If the surface be painted, stained or mahogany, use warm soft water, and add just enough hard soap to make weak suds. Begin at the top and wash down; only wash a small piece at a time before wiping it dry with a clean cloth. The atmosphere should be dry and at least 70 °Fahr. For ordinary work use the varnish thin, diluting it with methylated spirits if necessary. A teacup will answer as a rule for a varnish cup, which should be cleaned immediately the work is finished. If there be any surplus varnish left in the cup, throw it away, but do not return it to the can. Spread the varnish on lightly and evenly; do not try to smooth up after the varnish has begun to set. In cold weather wash the first coat with water after the varnish has set, then dry with wash-leather. If there be any white spots on the varnish, remove them by rubbing them with a woollen cloth and coal oil. After varnishing do not allow dust or damp to settle on it before it is perfectly dry. If only one side of an article be varnished, support the article, varnish side downwards, so that dust does not settle on the varnish. After applying the first coat, leave it to dry for a week if possible; then rub down with felt and pumice powder and water before applying the next coat. If alcohol varnish becomes dull and spongy, place narrow strips of gelatine in it. The gelatine will absorb the moisture in the varnish, which is most probably the cause, but will not be dissolved itself. The gelatine may be dried, and used over and over again. When the varnish is clear, remove the strips of gelatine, and add more methylated spirits if necessary. Many varnishes are mixed up with powdered glass. In nearly all cases the varnish should be strained, the powdered glass being merely put in to break up and mix the gums.

VARNISH: AMBER. (1) Boil 6 oz. clean amber dust in 1 pt. clarified linseed oil until it becomes "ropy". When nearly cold add about 2 pts. turpentine to thin to the required consistency. (2) Mix 6 parts clean amber dust in 1 part Venice turpentine and 20 parts turpentine.

VARNISH: BLACK. (1) Warm and mix over a fire 3 oz. asphaltum and 8 oz. burnt umber in 4 qts. boiled oil. Remove the varnish from the fire, and while still hot thin with turpentine. (2) Dissolve 1 lb. ivory black, 1 lb. lampblack, 1 oz. indigo, 4 oz. gum-arabic and 6 oz. brown sugar in 2 pts. hot water; ½ oz. spirits of wine may be added if desired. [*See also* VARNISH (JAPAN: *Black*)]

VARNISH: BRASS-COLOURED. To lacquer tin to give it the appearance of brass, colour the lac varnish with turmeric; to represent copper, colour with annatto. [*See also* VARNISH (LACQUER)]

VARNISH: CHEAP. (1) Boil 1 qt. best raw linseed oil for 1 hr.; then add ½ lb. powdered resin, and stir till dissolved. Take off the fire, and thin by adding ¼ pt. turpentine; then strain. (2) Mix

any of the ochres or leads with coal-tar, and thin as desired with turpentine. Japan may be added as a drier.

VARNISH: CHINESE. Mix together 3 parts fresh beaten defibrinated blood, 4 parts slaked lime and a little alum. The varnish is ready for use immediately, and two or three coats should be given. This varnish makes wooden and wicker work water-tight, and paste-board as hard as wood.

VARNISH: CHROMO. Dissolve a piece of isinglass about 3 in. square in 3 or 4 tablespoonfuls of warm water. Apply this size to the chromo before applying any varnish, and leave it to dry. White glue may be substituted for the isinglass. (1) Mix 12 oz. mastic, 2 oz. 4 drms. pure turpentine, 30 grs. camphor, and 4 oz. pounded glass in 3½ pts. turpentine. Agitate till the mastic is dissolved; leave it to settle for 3 or 4 hrs., and then pour off the clear varnish. (2) Beat up the white of 1 egg and ½ oz. loaf sugar in lime-water to the required consistency. Apply No. 1 or No. 2 with a camel-hair brush when the isinglass solution is dry. [*See also* VARNISH (CRYSTAL)]

VARNISH: COPAL. (1) Break up 1 lb. copal into small pieces, and roast it to oxidise it. Boil the copal and ¾ lb. resin in 1 qt. linseed oil over a slow fire for 15 mins.; then add 2 oz. sugar of lead, and boil slowly for another 15 mins. When cool enough, thin to the required consistency with turpentine, and strain. (2) Fuse 7 lb. pale African copal, and then pour on ½ gal. pale drying oil. Boil until it becomes "ropy," and when cool enough, thin to the required consistency with turpentine. (3) Dissolve 4 oz. camphor in 3 lb. ether, and then add 1 lb. roasted and pulverised copal. Place it in a stoppered bottle, and when the copal appears partly dissolved and swollen, add 1 lb. methylated spirits and 1 oz. turpentine. Shake up the bottle now and again, and leave to stand for a few hours.

VARNISH: CRYSTAL. These varnishes are used for maps, water-colour drawings, etc., which should receive a coat of isinglass before the varnish is applied. [*See* VARNISH (CHROMO)] (1) Dissolve 4 oz. white shellac, 1 oz. camphor and ½ oz. Canada balsam in 1 qt. alcohol. (2) Warm 2 parts Canada balsam till quite liquid, and then pour in 3 parts turpentine, and shake up till mixed. Stand the varnish in a warm place for some hours before use. (3) Dissolve 4 oz. mastic and 4 oz. dammar in 1 pt. turpentine.

VARNISH: GLASS. Place 4 parts gum-mastic and 8 parts sandarac with 8 parts pure alcohol in a corked bottle, and warm it in a water bath. Heat the glass to 122° to 140° Fahr., and then varnish. This may be employed for transparencies, labelling glass bottles, etc.

VARNISH: GREEN. *Opaque:* Mix 8 parts crystal varnish with 2 parts borax; then add 1 part oxide of tin, 1 part calcined bone, 1 part verdigris and 1 part blue carbonate of copper. Chromine oxide may be added to vary the shade.

Transparent: Grind very finely together 1 part Chinese blue and 2 parts chromate of potash; then add and mix copal varnish. The success of this varnish depends on the grinding and incorporation of the ingredients.

VARNISH: JAPAN. The article should first be thoroughly cleaned and polished, first with emery cloths, then rotten stone and water, and then with a buff and crocus powder. Coat the article with a cream made from unslaked lime and water, and brush it off when dry to remove grease. After the grease is removed do not

touch the article with the fingers. The japan should be laid on with a soft brush worked rather dry, all the strokes being in the same direction. Immediately the japan is applied, heat the article in an oven at from 200° to 350° Fahr. The lower temperature is employed when japanning woods, and the temperature rises with different materials to 350° Fahr. for metals. Before japanning wood first give a priming coat of hot size or some "filler" to prevent the japan sinking in. The japans should be kept in air-tight bottles in a warm place.

Black: (1) Fuse and mix 12 oz. amber, 2 oz. purified asphaltum and 2 oz. resin. Remove from the fire, and when sufficiently cool, add about 1 lb. turpentine. This gives a very smooth jet-black surface, but is expensive. (2) Mix Zanzibar gum with Trinidad asphaltum in a copper vessel over a fire; then add linseed oil and black oxide of manganese to a stiff paste. Remove from the fire, and when sufficiently cool, thin with turpentine. Store for a year, and then strain before use. This is the japan usually employed by coach-builders. (3) Melt 1 lb. asphaltum, and then add 1 lb. balsam of capivi, which has been previously heated. Remove from the fire, and when cool enough, thin with turpentine. (4) Moisten lampblack with turpentine, and grind it up very smooth; then add it to copal varnish. (5) Heat and mix 2 oz. purified asphaltum and 4 oz. burnt umber with 2 qts. boiled linseed oil. When mixed, remove from the fire; and when cool enough, thin with turpentine.

Coloured: (1) Moisten the pigments such as red, vermilion, Indian red, green, Prussian blue, chrome yellow, indigo, or any of the metallic powders, with turpentine, and grind them up till a very smooth paste; then add and mix it with best copal varnish. (2) Mix 2 oz. bruised copal and 1 dr. camphor in 8 oz. turpentine and 6 oz. oil of lavender. Mix the pigments, if any, to a paste with turpentine, and add slowly and mix it into the varnish. (3) Mix 2 oz. resin and 2 oz. shellac with the necessary pigments in 1 pt. methylated spirits. [*See also* VARNISH (LACQUER)]

VARNISH: LACQUER. Clean the article with emery cloth, leather, and then lime to remove grease. [*See* VARNISH (JAPAN)] Place the metal on a hot plate, and keep it at about 150° to 180° Fahr. The lacquer should then be applied with a soft brush or cloth, worked rather dry, all the strokes being in the same direction. When the varnish is dry, the metal may be allowed to cool. The lacquer should be composed of the clearest varnish, the pigments ground in separate alcohol, and the two liquids then mixed together. If not more than ½ per cent. borax be added to the lacquer, it is claimed that the lacquer adheres more firmly to metals. The following are some of the pigments most commonly employed: aloes, annatto, dragon's-blood, gamboge, saffron, turmeric, etc. The following are some of the gums most commonly employed: gum-gutta, gum-juniper, gum-mastic, seed-lac and shellac. Lacquers made with turpentine are more durable than those made with alcohol. A few examples of lacquers are given, but the gums and pigments may be mixed to give any desired shade in red or yellow.

Light: Mix 3 parts aloes, 1 part turmeric to 100 parts clear shellac varnish.

Red: Mix 32 parts annatto and 8 parts dragon's-blood with 100 parts clear shellac varnish.

Yellow: (1) Dissolve over a fire 2 oz. bleached shellac, 1 oz. colophony and 2 oz. gamboge in 1 oz. Venice turpentine added gradually. Dilute with hot turpentine to the required consistency, and filter. (2) Powder and mix 2 oz. seed-lac, 2 oz. sandarac, 4 oz. dragon's-blood and a pinch of turmeric and gamboge with 3 oz. powdered glass. Dissolve them in a sand bath in 1 pt. turpentine, and then add 1½ oz. Venice turpentine and filter through linen. (3) Dissolve in a water bath 1 oz. mastic, 1 oz. sandarac, ½ oz. colophony and ½ oz. aloes in 10 oz. spike oil or turpentine; then add ½ oz. Venice turpentine, and filter through linen. (4) Mix 1 part turmeric and 4 parts dragon's-blood to a thin paste with alcohol, and then mix it with 100 parts shellac varnish.

VARNISH : LEATHER. (1) Mix 12 parts shellac, 5 parts white turpentine, 2 parts gum-sandarac, 1 part lampblack, 4 parts turpentine and 96 parts methylated spirits. (2) Dissolve 8 oz. india-rubber in 1 gal. turpentine; then mix it with an equal quantity of hot linseed oil over a slow fire. (3) For harness and similar goods, first oil and then sponge over with a lather made of Castile soap. Boil ½ oz. gum-tragacanth with 2 qts. water down to 1½ pts.; the gum should be frequently stirred whilst boiling. When nearly cold, and when the leather is dry from the lather, apply a thin coat of the gum. (4) Brush over the leather with a broad soft brush dipped in a concentrated solution of resin in an alcohol solution of shellac. (5) For ladies' shoes, etc., add 4 oz. white pulverised wax, 1 oz. clear transparent glue in small pieces, 2 oz. gum-senegal, 2 oz. white soap shavings and 2 oz. pulverised brown sugar to 3 lb. boiling rain water. The ingredients should be placed one by one into the boiling mass. Now remove from the fire, and when sufficiently cooled, add 3 oz. alcohol and then 3 oz. fine Frankfort black. This varnish is applied to the leather with a brush, and it can be afterwards polished with a large brush like ordinary blacking. (6) For shoes, etc., dissolve 1 part extract of logwood with a little neutral chromate of potash and sulphate of indigo, in 40 parts methylated spirits; then add 10 parts shellac and 5 parts turpentine.

VARNISH : MOTHER-OF-PEARL. Mix a concentrated solution of salt with dextrine, and lay on a thin coat with a soft broad brush. This varnish may be applied to wood, or paper if the paper be previously sized, or to glass if the glass be previously varnished with shellac varnish.

VARNISH : OAK. Dissolve 3½ lb. clear pale resin in 1 gal. turpentine.

VARNISH : OIL-PAINTING. Boil parchment cuttings in water till a clear size is formed; then strain. Give the painting two coats of the size, passing quickly over the work, so as not to disturb the colours. Mix together in a water bath 2 drs. camphor and 19 oz. turpentine; when dissolved add 6 oz. mastic and ½ oz. pure turpentine. Apply the varnish to the previously-sized painting.

VARNISH : ORNAMENTAL WOOD. First give the wood a wash of thin glue water, and let it dry slowly. For light-coloured woods, a light pigment, such as chalk, is added to the wash; for dark woods, a darker pigment. When the wash is dry, rub over with pumice stone, and then apply one of the following varnishes: (1) Mix 2 lb. copal varnish with ½ oz. linseed oil varnish; place it in a warm place, and shake it up periodically. Apply this varnish, and when dry, rub over with a

solution of wax in ether. (2) Mix in a water bath 3 oz. sandarac, 1½ oz. mastic, 1½ oz. copal and 2 oz. powdered glass in ½ pt. alcohol and ½ pt. turpentine. Shake up frequently while dissolving, and when dissolved, strain and bottle.

VARNISH: PHOTOGRAPHIC. (1) Dissolve 150 grs. pyroxyline in 140 oz. amyl acetate and leave for a week. This varnish is known as zapon varnish. (2) Dissolve 1 oz. bleached shellac and 1 oz. sandarac in alcohol. To clarify the varnish, if it appear turbid, *see* VARNISH (SHELLAC).

VARNISH: SEALING-WAX. Mix 3 lb. best sealing-wax and 1 lb. shellac in 1 gal. methylated spirits; place it in a warm place, and often agitate it till dissolved; then strain and bottle. This varnish is used for coils on electric machines, making corks air-tight, etc.

VARNISH: SHELLAC. Powder the shellac very fine—bleached shellac sold in sticks is best—and then dry it over a fire, care being taken not to burn it. The best varnish is made by dissolving 6 oz. powdered shellac in 1 pt. spirits of wine; the next best in methylated spirits; then in naphtha. The varnish will most probably be slightly turbid, and to clarify it, add ¼ its bulk of benzine to it. Shake and stir up the mixture every 10 mins.; and in tabout 1 hr. the clear shellac varnish will be at the bottom, the impurities being absorbed by the benzine. Draw it off, and then slightly warm, and stir it to drive off any benzine there may be in it. If the turbid solution be allowed to stand undisturbed for a long time, the impurities will sink to the bottom, and the clear varnish may then be poured off. The varnish may also be clarified by passing it through animal charcoal. [*See* FILTER (OIL AND JELLY)]

VARNISH: TO REMOVE. (1) Cover the varnish with alcohol, and after a short time it will become soft, when it can be readily scraped off. (2) Where there are no sharp corners to destroy, rub over the varnish with emery cloth or glass paper.

VARNISH: VIOLIN. (1) Mix 6 oz. gum-mastic with 1 gal. alcohol and ½ pt. turpentine varnish; place it in a warm place, and shake periodically till dissolved. Strain before using. (2) Dissolve 4 parts sandarac resin, 2 parts shellac, 1 part mastic, and 2 parts benzors resin in 32 parts alcohol; when dissolved add 2 parts Venetian turpentine. Strain before use.

VARNISHED SURFACES: TO CLEAN. To take the dirt off finely-varnished articles, such as musical instruments, saturate a piece of old silk with paraffin and rub over thoroughly; then polish with linseed oil.

VASE: RUSTIC FLOWER-. *Bark:* Fasten virgin cork or poplar bark vertically on to any rough box with brads, and ornament with lichens and grey bearded moss. A fringe of moss may be threaded on fine wire and hung round the bottom.

Bowl: Use an old bowl of the required size, and tack on roots and knots, making the whole as knotted and fantastic as possible. The support or stand should be ornamented in a like manner. If a darker tint be required stain with 2 oz. asphaltum dissolved in ½ pt. turpentine or coal oil, and then varnish the whole with copal varnish.

Box: Make a strong box from beech or oak, and ornament it with pine cones, acorns, etc., as desired. [*See* BOX (BULB)] At each bottom corner a large cone may be suspended with wire like a tassel. Varnish with copal varnish.

Log Cabin: Select sticks as

straight as possible about 1 in. diameter × about 12 in. long. 1 in. from the ends of the sticks bore small holes with a red-hot knitting needle. Thread the sticks on to four stiff upright wires, so as to form an open-work box. Varnish with copal varnish, and line with moss before filling it with earth. To fill wooden flower-pot vases, first make a layer 1 or 2 in. deep of charcoal, and then fill up with rich loamy soil. A few holes should be bored in the bottom to carry off surplus water. These vases may be set direct on the ground, or supported on posts driven into the ground, or tree stumps. The support should in all cases be ornamented to correspond with the vase it carries.

VELVET: NAP ON. To raise the nap on velvet, place a damp towel over the face of a moderately warm iron; lay the velvet immediately on this, and as the steam passes through, brush briskly with a nail-brush in the direction that should raise the nap.

VENEERING. The wood to be veneered should be perfectly smooth and flat. The glue should be rather thin, and the veneer should be kept tightly pressed on to the wood till the glue is dry.

VINEGAR: POTATO. Place clean potatoes in a large vessel, and boil them till done. Pour off the water, and strain it. Place it in a warm place and add 1 lb. sugar, some hop yeast, and a little whisky to every 2½ gals. potato water. Leave to stand for three or four weeks.

VINEGAR: ROTTEN APPLE. Place rotten apples in a barrel with a few holes in the bottom; add a little water, and press out the juice. The cider thus extracted will turn to vinegar.

VIOLIN STRINGS. Do not smooth violin strings with pumice stone, or bleach them with sulphur. Before using an old string apply a very little sweet oil, or the oil of almonds; the oil should afterwards be wiped off. If the wire round the G string becomes loose, apply a little oil to it, and the gut will swell and make it tight. Copper wire is considered better than silver for G strings.

WALL: DAMP. To prevent moisture rising up the bricks from the ground, spread a layer of fine concrete on the top of the foundation, and thinly coat the top with asphaltum laid on hot. Heat the bricks which form the next course over a charcoal fire, and dip them lightly in asphaltum before they are laid. To prevent water soaking through the wall when the rain is driven against it sideways: (1) Dissolve 12 oz. mottled soap in 1 gal. boiling water. Spread the hot solution on the outside of the bricks, care being taken that it does not lather, and leave for 24 hrs. to dry. Dissolve 4 oz. alum in 2 gals. water, and apply it over the soap-wash coating. (2) Heat 1 part sulphur in 8 parts linseed oil to 280° Fahr. in an iron vessel. Apply this liquid as a paint on the outside. (3) Paint the inside walls with white-lead paint, a little litharge being added for a drier, which should be of the consistency of thin cream. The oil will be absorbed by the plaster in a few hours, but leave for two days before applying the second coat. The second coat is applied a little thicker, and if the absorption of oil be not great ½ spirits of turpentine is added to the third coat, but if the absorption has been great, less turpentine should be added. Into this coat the colouring ingredient may be put to bring it nearer the colour of the finishing coat. The finishing coat is made of very thick white-lead paint, and coloured with the ingredient necessary. The

paint is then thinned with turpentine. (4) Plant ivy up the walls, and let the ground slope from the wall to an open gutter about 1 ft. away.

WALL-PAPER: TO CLEAN. (1) Cut an ordinary loaf about two days old into 4 or 6 parts. Blow off the dust from the paper with a pair of bellows; hold a piece of bread by the crust, and give a light steady sweep down the paper. Go round the top of the wall, always moving the bread straight down, and cutting it away immediately it becomes dirty. Then begin a little lower, and go round the room again, beginning each successive course a little higher up than the last ended. (2) Take a piece of wood the shape of a scrubbing-brush, nail a handle on the back, and a piece of sheep-skin with the wool on it, flax, tow or flannel on the face. If flannel be used several thicknesses must be nailed on. Bring the ends of the material round and nail them on the back, to avoid nail heads on the face. Dip the brush in dry whiting and proceed as explained in No. 1. The paper and whiting must be perfectly dry.

WALL: PLANK. Very solid walls for barns, cottages, etc., may be constructed of planks where wood is abundant, but only sound seasoned wood should be used. Saw the planks any thickness, say 2 in. × 3 and 3½ in. wide. Lay the planks on the top of each other, flat sides down, each alternate plank being a narrow one, so that every other plank projects ½ in. on the inside, the outside being kept flush. The projecting course on the inside will serve to hold the plaster. At the corners the planks should lap each other at each alternate course, and there held in place with iron spikes first made red hot and then dipped in linseed oil. At every fourth course 1-in. auger holes should be bored about 3 ft. apart all round the walls, and oak pins driven into them. These holes should be drilled, so as to break joints all the way up the wall. Where doors and windows occur, the frames are inserted, and the planks cut accordingly. Partitions are built in the same way of 3-in. planks, projecting ½ in. alternately on either side, to hold the plaster. The partition planks should be let into the main walls occasionally, so as to lock the work well together. Plane the outside flush, and apply three coats of some durable sand wash, or paint.

WARDROBE. Cut two pieces of deal 1 ft. wide × 6 ft. long × 1 in. thick for sides. Screw a piece on the top 1 ft. wide × 4 ft. long. Fix a ½-in. iron rod along the edge of the top and hang a curtain on rings from it.

WASH. Do not apply washes to a surface which may have to be painted over at some future time, as they leave the surface in a bad state to receive oil paint. No wash is as durable as paint, but it is cheaper, and more quickly applied. Bricks and all absorbent surfaces should be made thoroughly wet before applying the wash. To apply whitewash to plaster, commence in the corner of the room; wet about 6 ft. square of the wall, apply the brush next to the side wall, and sweep out with an easy stroke, letting the brush gradually recede from the wall, and never stopping short, and only brushing in the one direction. Next extend the strip about 6 ft., apply the brush to the end of the strip, and sweep on to the first place washed. Continue the strip, always setting the brush at the end, and sweeping on to that washed before. It is essential, that each coat be put on even and without streaks. When dry, apply the second coat, and make the strips at right angles to the strips

on the first coat. Make the strips on the third coat the same as the first. To prevent the wash rubbing off, a teacupful of alum dissolved in boiling water may be added to each bucketful of the wash. To preserve uniformity of tint, the wash should be frequently stirred during use.

WASH: BRANARDS. Dissolve 10 lb. shellac in 10 gals. boiling water; then add 30 oz. saleratus. Mix the solution with any wash mixed in the usual manner.

WASH: BRICK. Mix 3 parts Rosendale cement and 1 part clean sharp sand with water. This gives a granite colour, the shade depending on the shade of the cement. Add Venetian red to make brick colour, or lime for a light colour.

WASH: BROWN. A cheap wash for wood is a solution of persulphate of iron of from 2° to 2½° Baume. The blue-grey tint this acquires on drying is changed to brown on the application of linseed oil varnish.

WASH: CALCIMINE. (1) Powder and mix together 3 parts siliceous rock or quartz, 3 parts marble, 2 barrels porcelain clay and 2 parts freshly-slaked lime whilst still warm. Apply the wash to the wall, and leave for a day; then give numerous coatings of water, for each time the wash is wetted it becomes harder and more waterproof. (2) Prepare as Paris whitewash [*see* WASH (WHITE: *Paris*)], and add the pigments immediately after the glue.

WASH: COPPERAS WATER. Dissolve 2 oz. pulverised copperas in 1 gal. hot water, and let it stand for a few days, stirring it occasionally. Slake quicklime with this, and add to the wash as much lime water as there is lime; then add about 1 pt. fine sand. This wash may be deadened by the addition of alcohol. Stir the wash up whilst using.

WASH: FIREPROOF. For woodwork not exposed to the open air, mix 5 parts alum, 7 parts rye meal paste and 30 parts finely-powdered clay in water. For exposed woodwork, mix 2½ parts sal-ammoniac, 1 part white vitriol, 2 parts glue and 20 parts zinc white in 30 parts water.

WASH: FLAX-SEED. Boil ½ lb. flax seed for 2 hrs. in a pail of water; strain, and add 2 qts. common plaster, 2 qts. wood ashes, 1 teacupful wheat flour and 1 teacupful brine. Leave the wash to stand several days, and stir frequently.

WASH: GLUE. Make a paste of 1 lb. flour. Make 1 lb. glue and mix with the paste. While hot add 1½ pts. linseed oil, and put the whole with 25 lb. whiting which has been soaked up to the proper consistency in water. Spread this wash in the ordinary way, but a trifle thick.

WASH: HARD. (1) Melt together 40 parts pulverised chalk, 50 parts resin and 4 parts linseed oil; then add 1 part oxide of copper, and afterwards 1 part sulphuric acid. The acid should be added slowly, and the mixture stirred all the time. Apply the wash while hot. (2) Mix ½ pailful of lime and water, and add 1 pt. hot flour starch to it. A little treacle or melted sugar may be added, which will make the wash slightly firmer.

WASH: HOW TO COLOUR. To colour whitewash cream, add yellow ochre; pearl colour, add lampblack; fawn, add umber, Indian red and lampblack; stone colour, add raw umber and lampblack; pink, add red lead. To prevent lampblack floating on the top of the wash as a greasy film, slake the freshly-burnt lime with just sufficient water to cause it to fall into powder. Stir the lampblack up with this powder till it becomes of a uniform grey colour,

and then add boiling water, and stir constantly till of the required consistency; the other pigments, if any, should then be added. It should be noted that all colour washes dry lighter than when wet.

WASH: LEAD AND CEMENT. Mix 2 parts lime water and 1 part ground white lead in boiled linseed oil, and grind all together in a paint mill or through a cloth; then add oil till of the required consistency.

WASH: MILK. (1) Sweet milk may be substituted for oil in all inside work, where the smell of oil would be objectionable. If a building is to be repainted with wash of a darker shade on the outside, the wash is rendered more durable by adding 1 pt. sweet milk to 1 gal. of the wash. (2) Mix slaked lime with sour milk, and add any dry colour desired; dilute with water, if necessary, till of the consistency of ordinary wash. Three or four coats will be necessary, and the wash must be continually stirred up while it is being applied. This wash is very durable.

WASH: OIL. (1) Slake a barrowful of quicklime and make it to a thick wash with water; then stir in 1 qt. boiled and 1 qt. raw linseed oil. When mixed stir in 6 lb. umber and 6 lb. ochre gradually. (2) Mix 1 part fine sand, 2 parts wood ashes and 3 parts slaked lime. Sift through a fine sieve, and stir up in linseed oil to the consistency of paint. Apply the first coat light, the second coat heavy. This wash is cheap and very durable, and is practically fireproof. (3) Make a thin wash of 1 peck lime; add 25 lb. mineral paint, 25 lb. whiting, 25 lb. finely-sifted road dust, ½ gal. soft soap and linseed oil till a thick paste. Thin to the desired consistency with fresh butter-milk.

WASH: RICE. Slake 1 peck lime with hot water; strain, and add 1 qt. rock salt, 1 lb. rice made to a paste [*see* PASTE (RICE-FLOUR)], ½ lb. whiting, and ½ lb. dissolved glue. Leave to stand for a few days, then heat up, stir, and apply.

WASH: STONE. To render stone and brick waterproof, coat to saturation with a solution of silicate of soda, which is decomposed by the further application of chloride of calcium.

WASH: TREE. Mix 4 parts resin, 4 parts soft soap, 2 parts tar and 1 part sperm oil. This wash is painted in a broad band round the trunk to protect the tree from insects.

WASH: WHITE-. *Common:* (1) Pour enough warm water slowly on to quicklime to keep it from burning, but not enough to drown it, and then reduce it to a thin wash. If the wall be very rough, mix salt and ashes with the first coat; if it be smooth, mix salt only. A little bluing should be put into the last coat. (2) Mix freshly slaked lime with water till it is of the consistency of thin cream. Dissolve a small lump of copperas in water, and add the liquid to the wash. The wash should be stirred up every time the brush is dipped in.

Durable: (1) Add 1 lb. tallow and 2 qts. concentrated rock salt brine to 1 peck lime while it is slaking. Thin to the required consistency, and then add colouring ingredients, if necessary. This makes a good outdoor wash. (2) Slake ½ lb. lime with 1 pt. skimmed milk. Dissolve white Burgundy pitch in 6 oz. oil; then add it slowly to the lime. Now add 3 pts. more skimmed milk and 3 lb. whiting.

Hard: Slake ½ bushel lime with boiling water; then add 2 lb. sulphate of zinc and 1 lb. salt.

Paris: Soak ½ lb. glue for about 12 hrs. in tepid water, and then make it into glue. Put 6 to 8 lb.

Paris white into another vessel, add hot water and stir till it has the appearance of milk of lime. Add the glue, stir, and apply while warm.

Vitriol: For outside work slake 1 peck stone lime, and add 2 qts. sweet milk. Dissolve ½ lb. salt and ¼ lb. white vitriol in water, and add it to the lime. Thin to the required consistency, and add colouring ingredients as desired.

WASH: YELLOW. Mix 1 lb. copperas in 8 gals. water and let it stand for 24 hrs., stirring it from the bottom two or three times. Slake the lime with this, and thin it to the usual consistency. Add an amount of hydraulic cement equal to the lime, and 2 qts. sand to every 15 gals. of wash. Stir frequently to prevent the sand settling.

WASH: ZINC. Mix oxide of zinc with common size, and apply it for first coating. When dry, paint on a wash of chloride of zinc, which will produce a glossy surface.

WASHING FLUID. (1) Boil 1 lb. soda ash and 1 lb. unslaked lime in 4 qts. water; then leave it to settle, and pour off the clear liquid. Soak the clothes in water, to which ½ cupful of the fluid has been added, for 12 hrs. Then rub the clothes, and put them in the boiler, which should contain soft water, ½ cupful of the liquid, and a few slices of soap. Let the clothes boil 10 mins., and then rinse. (2) Dissolve saltpetre in soft water. This is said to be quite harmless to any clothes.

WATER: HARD. To test for hardness, add a few drops of a solution of soap and alcohol to the water. If the water be hard, white flakes will form; if not hard, the water will remain clear.

WATER: IMPURE. To test if the water be impure, mix 10 grs. pure white sugar in 10 oz. of the water; place it in a tall jar in strong daylight in a warm room, and tie muslin over the top to keep out all foreign matter. If the water become turbid within ten days it is impure; if it remain clear, it is most *probably* pure from sewerage. [*See also* WATER (HARD)]

WATER: TO PURIFY. The only method for making water safe to drink is to boil it. To remove the flat taste, and possibly vegetable sediment, filter through charcoal. The carbon of the filter should be renewed periodically. For removing the smell arising from foul water, and for precipating organic growth: (1) Add about 1 oz. hypermanganate of potash to every 50 gals. water. The chemical action is marked by a purple colouring, and this colour indicates the presence of organic matter. The hypermanganate should be added until this colouring disappears. As an aid to keeping water pure, it should be frequently agitated. (2) To clear muddy or soapy water, stir in a little alum water. In times of drought washing water may thus be used a second time. (3) A few scraps of iron, or chloride of iron, will prevent bad odours rising from standing water. (4) Add caustic soda or concentrated lye to cistern or stagnant water. (5) Sprinkle finely-powdered charcoal over the surface of rain water in the evening, and in the morning the water will be clear. (6) Keep a few small fish or a frog in the tank or well.

WATER: TO SEE UNDER (1) Cut two boards 5 in. wide, and two boards 3 in. wide from ½ in. deal of the required length, the length depending on the depth of water. Nail them together to form a square tube 4 in. × 5 in. outside. Before nailing together saw a kerf on a broad side half-way through each board and 1 in. from the end; into this fit a piece of glass 3½ in

× 4½ in. Coat all the joints between wood and wood, and wood and glass, with white-lead paint, and then nail together. The tube end will have to be weighted with sinkers. It is an advantage to cover the head with a cloth. (2) When water is frozen over, cut a hole through the ice, apply the face to the opening, and cover the head with a blanket. In summer a float with a hole cut in it may be substituted for the ice.

WAX: COBBLER'S. (1) Melt and mix 5 parts resin, 5 parts pitch and 2 parts tallow. Whilst cooling, work it with the hands under warm water. (2) Simmer together 1 lb. pitch, 1½ oz. beeswax, 1½ oz. resin, 2 heelballs and 1 pt. boiled oil. This makes a liquid wax.

WAX FLOWERS: TO MAKE. Select a number of leaves, such as oak, ivy, geranium, fuchsia, heliotrope, etc., and place them face downwards on a large sheet of writing-paper. Brush carefully over the back of each leaf with melted lard, applying it with a common gum brush. Mix some plaster of Paris with water in a bowl to the consistency of batter; dip some out quickly (as it hardens very soon), and cover each leaf with a thick coating. Smooth over with a knife, and in about half an hour turn over the moulds and remove the leaves gently with a penknife. Allow the moulds to harden thoroughly before using them, and just before use thoroughly saturate them with water. The moulds are sometimes painted with thin shellac varnish, which gives the wax a more shiny appearance, but the veining is then not so sharp. To prepare the wax, melt best cake wax in an earthenware dish over a slow fire; then add a tablespoonful of finely-crushed balsam of fir to every pound of wax, and thoroughly stir it in with a clean stick. If coloured wax be required, tie a small amount of dry paint up in a thin cloth, and press it into the wax until of the required shade. When all is mixed, strain through a thin white muslin cloth into a clean earthenware dish. Dip a pane of glass into a basin of water, shake off all the drops quickly, and then dip out a portion of the melted wax, and pour it lengthways over the pane. Slip the point of a knife under one edge, and remove the sheet of wax carefully. Wet the glass again, shake off the drops, dip out some more wax, and make another sheet, and so on, until enough sheets have been made. The room in which the sheets of wax are made should be warm, as the wax becomes brittle, and breaks readily when cold. To clean soiled wax, moisten a cloth with turpentine and rub very carefully.

Abutilon: Materials required: ½ package light green wax; ½ package white wax; ½ package light yellow wax; green spool wire; abutilon leaf-mould; glass-headed moulding-pin; small camel-hair brush; 1 tube dark yellow paint; 1 bunch rose stamens. The above will be enough for four bouquets. To mould the leaves, select a piece of wire 3 in. long, and wind it with a narrow strip of green wax; now wind two more pieces of wire, each 1½ in. long. Dip the leaf-mould in water, shake off the drops, and lay a sheet of wax lengthways on the back of the leaf-mould; press it down around the edges, when it will cut off. Now lay the longest-prepared wire in the centre of this leaf, and lay over it another piece of wax lengthways of the sheet. Press this firmly down so as to get a good impression of the veins. Dip the finger in water, and rub around the edges, when the leaf can be readily removed from the mould. Mould two more leaves in the

same way on the shorter lengths of wire, and join them to the first leaf to make a spray. It is best to have a natural spray of abutilon for a model. For the flower cut six pieces of white wax the shape and size shown in the illustration, and roll them until cupped around the rounding edges. Dip a camel-hair brush in dark yellow paint, and draw fine veins over them, as represented by the lines in the illustration.

Cut off a piece of spool wire 2½ in. long; make a hook at one end, and cover it with a narrow strip of wax ½ in. long × ¼ in. wide. Place five rose stamens in this, the one in the middle being longer than the rest, and fold the wax firmly around to keep them in place. Then wrap the stem with a narrow strip of light green wax. Place the six petals already made on the stem, allowing the bottom, which has a narrow, straight edge, to rest right around the full part covered with the narrow strip of wax. The abutilon is full shaped, and when all the pieces are on, the appearance should be rich and double. Finish off, when all the pieces are on, with a small piece of wax, and join the flower to the leaves.

Fruit: (1) Wax fruits are usually made by the use of double moulds, one for each half; or if the fruit be very irregular, the mould may have to be made in three pieces. Prepare a smooth, damp surface of sand, into which one half of the fruit is carefully pressed; a border of tin or stiff paper is built up all round and ½ in. away from the fruit, and plaster of Paris in a cream-like consistency is poured into the cell thus made, so as to fully cover the fruit. Leave the mould for about ½ hr., then take it up, extricate the fruit, turn the fruit round, and imbed the other half of it in the sand as before. Then make a mould of the other half of the fruit. Whether fruit be cast hollow or solid depends mainly on the size. If large, a core of some rough material may be inserted to save the wax. Some soft fruits, such as ripe plums, need very careful handling. For such fruits elastic moulds of glue are sometimes used. (2) Small fruits, such as grapes and currants, are made of glass bulbs, carefully blown to shape. These are fixed by wax to wire inserted into holes, and are then dipped into melted wax of the proper colour. Generally speaking, the colour of the wax employed is that of the lightest part of the fruit, the deeper tints being afterwards laid on with a brush. The chief pigments employed are burnt and raw umber and sienna, chrome-yellow, red lead, Prussian blue, carmine and lake.

Fuchsia: Materials required: ¼ package stem wire; ½ package each of white, pink and light green wax; fuchsia leaf-mould; 1 bunch fuchsia stamens. Cut eight pieces from the white wax the shape of Fig. 1, and roll them cup shape. *See Lily, Pond.* Make a hook at the end of the stem, then take a piece of wax barely 1 in. long and less than ½ in. wide, and roll it around the hooked part of the stem, which must be wound with a strip of wax, having first placed five stamens, two on each side and one in the centre of the long narrow strip before rolling it around. Let the centre stamen project one-third longer than the other four. Place the cup-shaped pieces, the first and second im-

Fig. 1.

mediately opposite, until four have been used; the remaining four are placed in the same manner, only a little farther down the stem. For a double fuchsia use eight pieces, for a single flower but four. Now cut from the pink wax four pieces like Fig. 2; roll so that the pointed part will bend slightly backward. Place on the stem with the straight part of Fig. 2 resting immediately where the pointed part of Fig. 1 was placed. Finish with a small strip of green wax for the calyx. To make a half-open bud, roll the

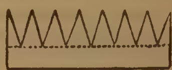
Fig. 2.

pieces like Fig. 2, as for the full-blown flower, but turn the pieces over and bring the points together just so that they will touch. Mould the leaves in the ordinary way.

Lily, Arum: Materials required: $\frac{1}{4}$ package magnolia wax; 1 yd. bonnet wire; $\frac{1}{2}$ package green pond lily wax; a small quantity of dry chrome-green paint; a small quantity of corn meal; and a wooden moulding-pin. Make the leaves from a mould of plaster of Paris in the ordinary way, using light green pond lily wax. For the flower cut two pieces of the cream coloured magnolia wax $5\frac{1}{2}$ in. long × $3\frac{1}{2}$ in. wide to the shape shown

in the illustration. One is for the full-blown lily, and one for an open bud. Cut a length of wire 9 in. long for the stem, and fold a piece of cream coloured wax $3\frac{1}{2}$ in. wide round it, beginning at the top, and folding it neatly in place for the calyx. Now roll the calyx in a little light yellow wax, and afterwards roll it in corn meal. Now mould the two pieces cut to the shape of Fig. 1 with the moulding-pin. This can only be successfully done by copying from a real lily. After rolling and moulding it to shape, place it on the stem, letting the bottom of the stem rest on the bottom edge of the calyx. Rub the lower edge of the calyx with a small quantity of dry green paint. Make the half-open bud in the same way, only roll it to give it a less open appearance.

Lily of the Valley: Materials required: 1 package white wax; 1 package dark green wax; 1 spool green silk wound wire; and a little dry chrome-yellow paint. Make two leaves for each spray of flowers from the dark green wax in the ordinary way. Cut eight pieces of the spool wire $1\frac{1}{4}$ in. long for the stems. Wind each stem with a narrow strip of white wax; place a ball the size of a pin-head on the top, and rub a little chrome-yellow over each. Cut eight pieces of wax to the shape shown in the illustration.



Place one of these around the stem, having first made a ball the size of a pin-head on the end. This little ball should be right in the centre of the flower, and is intended to represent the pollen. Turn the edges of the flower slightly back, and place a flower on each of the small wires, pressing down around the stems, and fastening the edges together with the warmth of the fingers. Attach the small wires to the stem by winding them carefully around, just enough

to fasten them, and curve the stem to make the flower hang down a little. Place the stem of the lilies upright between the leaves, and twist the stems together immediately at the bottom. The stem should only extend about half-way up the leaves.

Lily, Pink Day: Materials required: ½ package rose-pink wax; 4 pieces green stem wire; ½ package light green wax; and 7 lily stamens. For the full-blown lily cut two pieces the shape of

Fig. 1.

Fig. 1, 2½ in. wide × 4 in. long, and roll with a glass-headed moulding-pin. *See Lily, White August.* Use a piece of bonnet wire 6½ in. long for lily and bud stem; use the stem wire for the leaves. Wind the piece 6½ in. long with a narrow strip of green wax; then take two narrow strips of pink wax, and wind the stamens up to the ball part; dip the ball part of the stamens in light yellow paint. Then take a strip of pink wax ½ in. wide × 2 in. long, and fold lengthways around the stem, placing in the stamens, six of them exactly even with one another, and the seventh and middle one ½ in.

Fig. 2.

longer. Arrange the lily on the stem as for the *Lily, White August*, and finish with a green calyx. The leaves of this lily may be made without a leaf-mould; they are perfectly straight on the edges, and have fine veins. Cut off two pieces of green wax, as shown in Fig. 2, ¾ in. wide × 5 in. long. Having first wound three or four pieces of stem wire, cut out the leaves, laying in the stems exactly as if using a mould. Vein the leaves by drawing the point of the moulding-pin very carefully down the centre of each leaf three or four times after they are stemmed.

Lily, Pond: Materials required: 1 pond lily leaf mould; 1 package green stems for leaves; 1 package light green pond lily wax; 1 package white pond lily wax; 1 package light yellow wax; 1 package dark yellow wax; dry Indian red paint; 1 coil bonnet wire. Fold or double a sheet of light yellow wax lengthways of the sheet. Then with a pair of scissors notch it across, as in Fig. 1, 1 in. wide × 3 in. long.

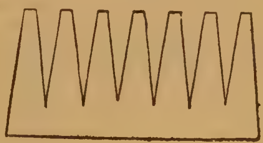


Fig. 1.

Pinch the end of each notch between the thumb and forefinger, and the notched strip will then be ready to place on the stem. Fold a dark yellow sheet in the same manner, and cut with a little larger point. Cut a piece of wire about 1 ft. long for each stem, and press a narrow strip of wax round, cementing it in place with the warmth of the fingers. Make a small hook at the upper end of the wire to prevent the leaves from slipping upwards in putting them together. Cover this hook with a small ball of yellow wax; with the point of the glass-pin make a dent in the centre of the ball, and draw lines from the centre to the outer

edge, to give the appearance of a star; then roll the light yellow strip round the stem, pressing it neatly and firmly down. Then put on the dark yellow strip, the points of which should be rubbed lightly with the finger dipped in Indian red paint. To make the white leaves, cut with the sharp point of the moulding-pin eight pieces, shaped as Fig. 2, 1½ in. × ¾

FIG. 2.

in. The wax should be laid on some clean white paper on a smooth table, and the pin dipped in water occasionally to keep it from sticking to and tearing the wax. Then dip the knob of the pin in water, shake off the drops, and roll the rounded end of the leaf until it is cupped half-way down its length, and especially at the end. When the light leaves are well rolled, place them on the stem. Place the bottom part of the leaf right on the stem, letting the edge of the leaf rest on the bottom edge of the centre of yellow wax. Place another leaf immediately opposite the first, pressing it firmly on with the warmth of the fingers, and so on till all the eight are on. Make

FIG. 3.

eight more leaves like Fig. 3, 2¾ in. × 1⅛ in., and having rolled them, place them on in the same manner, allowing the rounded edges of the shape Fig. 3 to project a little above those of shape Fig. 2. Make eight leaves to shape Fig. 4, 3 in. × 1¼ in. Roll them, and place

FIG. 4.

them on a little above shape Fig. 3. Make sixteen leaves, shaped as Fig. 5, 3 in. × 1¼ in., and place them on a little above shape Fig. 4. Make eight more leaves, shaped as

FIG. 5.

Fig. 5, only more rounded at the top; roll and place them as the others. Cut eight leaves of green wax, shaped as Fig. 4, 3½ in. × 1⅜ in.; roll and place on in the same manner as the white ones immediately over those last placed. For leaves wind two pieces of green stem wire with green wax for each leaf. Four leaves with a lily bud is sufficient. Dip the brass leaf mould in water, shake off the drops, then lay on a sheet of green wax, press it down lightly, so that it will adhere to the mould. Then place in the stem a little over half-way down the leaf. Fold over the sheet of wax, and press down firmly till all the veins are plain; then rub over the veins with a little Indian red. After the lily is completed, coil the wire up about three times, bending the lily stem until

it rests immediately in the centre of the coil; attach the leaves to the coil as neatly as possible, or what is better, fasten immediately to the stem of the lily. This must be done with great care, as the wax is easily broken. Make the bud in the same manner as the lily, but using only half the number of leaves.

Lily, White August: Materials required: 1 bunch lily stamens; ½ package double white wax; 1 package light green wax; a few green stems; and a little dry light yellow paint. The leaves should be made in plaster of Paris moulds in the ordinary way. Cut two pieces, shaped as in Fig. 1, 3 in.

FIG. 1

wide at the top × 6 in. long, from the double white wax; roll so that the points will turn outward a little, and the centre part of the lily be cup-shaped. Wind a piece of bonnet wire with green wax; cut a strip of white wax 2½ in. long × ½ in. wide, double it lengthways and roll it around the stem, placing in five lily stamens, the centre one projecting ½ in. beyond the rest. These stamens should first be wrapped to the ball with strips of white wax, sufficiently wide to cover them neatly, and the ball part dipped in dry yellow paint. Now place the two parts of the lily on the stem, joining carefully by pressing the edges together with the warmth of the fingers. The points of the lily must project ½ in. beyond the lily stamens. For a bud cut up pieces shaped as Fig. 1, only smaller than those for the flower. The lily and bud grow up out of a green calyx, shaped as Fig. 2. Cut the piece

FIG. 2

of green sheet wax, and place it on the stem, with the pointed part turned toward the top of the lily a little open. The bottom part of the calyx should rest immediately on the bottom of the lily stem, or to be plainer, on the bottom of Fig. 1.

Rose and Bud: Materials required: 1 package white, light pink, deep crimson or pale buff wax; 1 package green stem wire; 1 package dark green wax; and 1 package light green wax. Use a large glass-headed moulding-pin for moulding the leaves into shape. Make a small hook at the end of one stem wire; then with a narrow strip of green sheet wax, wind the stem neatly. Cover the hook with a small piece of wax, to form a a ball. This ball must be of the same colour as the rose. Below the first ball make one slightly smaller, which should be covered with green wax for the calyx when

the rose is complete. Cut ten leaves as shown in the illustration, 1¾ in. × 1 in. Roll them cup-shaped with the glass head of the pin

being careful to keep it wet with water. Roll the straight part of the first leaf round the bottom part of the ball made on the hook. Continue until five are placed on the stem, letting the sides of each leaf lap the one over the other. The five remaining leaves should be put on in the same way, only slightly below the first five. Now cut ten leaves a size larger, and roll them on in the same way. Vary the arrangement of the last five, by placing the hollow outside instead of in. Cut ten more leaves larger still, and place them on a very little lower than the last ones, giving them a curve here and there as in the natural flower. Now cover the calyx with a narrow double strip of green wax. To make a half-blown bud, use half the number of leaves. Use the green sheet wax for the stem leaves, moulding them on as described under *Lily, Pond*.

Vines: Materials required: 1 spool fine green silk-covered wire; 2 packages dark green wax; 2 ivy

leaf-moulds (1 small and 1 medium size); 1 package white wax; and 1 bottle deep carmine paint. The illustration represents a branch of Irish ivy, one-third natural size. Cut the wire for the main stem any required length, and cut short lengths for the leaf stems. Dip the large-sized leaf-mould in water; shake off the drop, and then lay on it a piece of dark green wax, enough to cover it just over the edges. Press that down firmly, and then lay in the stem right in the centre, after which lay on another piece of green wax, pressing it firmly around the edges, when it will cut off just the shape of the mould. Moisten the edges of the mould, and remove the leaf. Make about twenty-five of the medium size, and twenty-five of the small-sized leaves, and then arrange them as near the copy as possible. These sprays are often used for twining round picture-cords, etc.

WAX: MODELLING. Melt together 8 oz. beeswax, 8 oz. lead plaster and 8 oz. Burgundy pitch; add whiting to form a paste, and thoroughly mix all together.

WAX: MOULDING A FACE IN. Mix 1 lb. new wax with 5 oz. colophony over a slow fire. Oil the face with olive oil, covering the hair of the eyebrows, etc., with paste, and placing straws in the nostrils. When the wax is sufficiently cool to bear on the face, apply it with a brush to the thickness of about $\frac{1}{10}$ in. Take the wax off gently, and strengthen it with clay on the back side; or it may be strengthened on the front side, and a plaster cast taken from the inside.

WAX: TRANSPARENT. (1) Simmer together 2 oz. best white resin and $\frac{1}{4}$ oz. white wax for 5 mins.; then add $\frac{1}{4}$ oz. tallow, and simmer for 10 mins. longer. Pour the wax out into water, and knead it with the hands. (2) Simmer 2 oz. best white resin and $\frac{3}{4}$ oz. best white wax in an earthenware pot for 10 mins.; then pour out into water, and knead it with the hands.

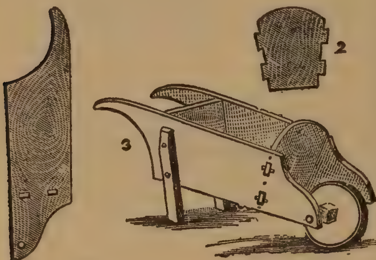
WELDING. Knock out the two pieces of iron or steel as though they were to be spliced together, only where the binding would come, leave the metal thicker. Heat both pieces till just on the point of melting. Place them together, and hit hard and fast, turning the bar round. When the metal becomes dull red, place a chisel along the joint, and hit it to see if the weld will open. If it does, the pieces must be taken apart, and the process repeated. The number of times the iron has to be reheated, and then knocked to shape, depends on the workman. To weld steel to iron, heat the iron most, as it is less fusible. Sal-ammoniac cleans dirt from steel; borax causes it to fuse before it obtains that heat which will cause it to burn; consequently a mixture of these two substances form one of the best fluxes for welding.

WELL: FOUL AIR IN. Place a candle or lamp in a pail, and lower it down the well. If the light continue to burn until the pail rests on the water, it will be safe to descend; if, however, the light be extinguished, the foul gas must be removed before it will be safe to descend. Lower a pail full of burning straw or shavings, or drop 2 or 3 qts. freshly-slaked lime down the well. Test with the light again before descending, and repeat if necessary.

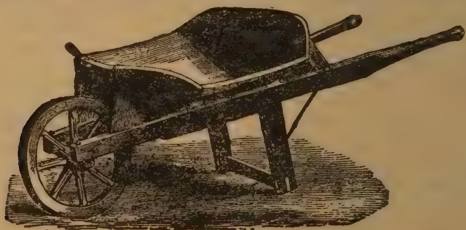
WELL: SHALLOW. Shallow wells drain water from the surrounding soil only; if it happen to be sunk in a water-bearing impervious stratum it is really a deep well. A shallow well is for this reason not fit for drinking. The well should always be kept covered, and the sides left rough for rats to escape. The well should be cleaned out periodically. The lining of the well should be concreted at the back, and steined with cement as far down as possible. The well should project 2 or 3 ft. above the ground level, and slope away in all directions. This slope should be paved or concreted. To excavate the well, dig down as far as possible without bricks or steining. Cut out an elm curb or hoop of two or three thicknesses, and lap-jointed, and lay it on the bottom. A half-brick ring is built on this curb, and steined outside with cement to make it water-tight. A thickness of concrete may be laid between the cement and the bricks with advantage. The excavation is then continued inside the curb. When a second section has been excavated, the earth supporting the curb is cut away with the exception of a few piers. A heavy wooden base is then placed on the bottom, and heavy wooden struts fitted from the centre of this base to the under side of the curb, and wedged firmly in place. The piers of earth can then be removed, and the inside built up for the second portion, placing a second curb on the bottom. When the brickwork of the second section is completed, the struts should be removed, and a third section made exactly as the second. This under-pinning process may be carried down as deep as desired. It should be remembered that the farther down a well is carried, the more dangerous the work becomes; also that the flow of water to a well is proportional to the cube of the depth.

WHEEL-BARROW: PLANK. Use a board 12 in. wide of 1-in. well-seasoned elm or similar wood. Cut off the two sides 50 in. long over all × 12 in. deep, as shown in Fig. 1. Cut off one tail board 20 in. long at the top, 18 in. long at the bottom × 12 in. deep. Cut off one front or head piece 12 in. deep, as shown in Fig. 2; the slope of this will take up 1 in., and

the round top 1 in., making together 2 in., which will bring the front board to its proper depth. This board should be cut off the same

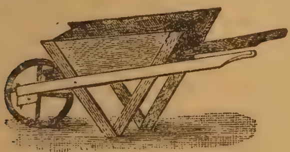


breadth as the tail board, but as there are two 2-in. tenons on each side, the sides will slant together towards the wheel, making the barrow 4 in. narrower at the front end than at the back end. It is best to cut the mortises in the side pieces first, and then the tenons to fit them. The head board should be slanted, so that the distance from the handle to the top of it is equal to the distance from the handle to the bottom of it. When the head piece is fitted to the side boards, mark off the pin-holes. Separate again, and drill the pin-holes with a ¼-in. bit. Use 1½ in. elm for the wheel. Strike out a circle 19 in. diameter for the outside, and a 1½ in. circle at the centre to receive the axle. Now mark off a 1½-in. square on this circle, so that the circle touches the middle of each side, and cut it out. Use 1½ in. × 1½ in. ash or oak for the axle. Have a tyre put on the outside of the wheel, and then make a very tight fit of the axle in the wheel. Cut off the axle, so that it will be an easy working fit when in place. Mark off the centre of the axle at each end, and drill two bare ¼-in. holes about 4 in. down. Now taper off the axle, making it rounded, and about 1¼ in. diameter at each end. Procure two 1¼-in. slightly-conical ferrules to fit on the ends. Leave them a little too small, so that they will not drive on to the ends of the axle; then heat them red hot, drive them on, and plunge them immediately into cold water. The ferrules will be firmly shrunk on by this method. Now drive into the ¼-in. hole already drilled in the ends two pieces of full ¼-in. iron, having previously pointed the ends. Bore a ½-in. hole in each side piece to receive the gudgeon, and drive into each hole a piece of 5/16-in. gas barrel, 1 in. long, which will be about ½ in. on the outside. Fit the gudgeons into these bearings; fit the tenons of the head piece into the mortises, and drive the pins in lightly. Screw the tail board to the sides with six ¼-in. screws, 3 in. long. Now drive the pins through the tenons up tight. Fit the bottom inside the frame, and fix in place with ½-in. cut clasps. Cut two



Dumping Wheel-barrow.

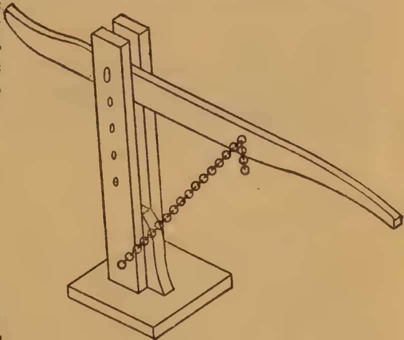
pieces of ash $1\frac{1}{2}$ in. × 1 in. × 20 in. long for the legs. Bevel one end of each from the flat side about 4 in. down, and screw it on with two screws. Cut off the bottom of the legs, so that they rest square on the ground. Illustrations are also given of the scantling wheel-barrow, which is



SCANTLING WHEEL-BARROW.

extremely simple in construction; and the dumping wheel-barrow, which is very strong but not so simple to make. The wheels may in all cases be made as described, or bought ready-made, as shown in the illustration.

WHEEL-JACK. Cut a piece of $1\frac{1}{2}$-in. deal 1 ft. square for a base, and set in it a curved piece of 2-in. wood 9 in. high × 9 in. wide at the base, with a mortise and tenon joint. Saw from $1\frac{1}{2}$ in. wood two pieces 4 in. broad × 3 ft. long; screw them vertically on to either side of the piece set into the base, for uprights, taking care that the bottom ends butt hard on to the base. Screw a distance piece 6 in. × 4 in. × 2 in. between them at the top. Bore $\frac{3}{4}$-in. holes through both uprights in the clear 1 ft. 9 in. left, 3 in. apart, to rest the pin in. Make the lever from 2-in. wood 4 ft. long × 4 in. deep, 1 ft. from one end; it is shaped and tapered away from this point towards each end as desired. Bore a $\frac{3}{4}$-in. hole near the bottom of the deepest part of the lever for the pin to work through, and drive bolts vertically through the lever on each side of the hole to prevent the wood splitting. Attach a chain to the bottom of one upright and a hook in the lever, so that by hooking the chain on to the lever the jack may be kept in any position. Use a piece of $\frac{3}{4}$-in. iron



bar 6 in. long for the pin. The lever may be pivoted through the different holes, so that different-sized carriages may be supported.

WHEEL-JACK: TEMPORARY. To lift heavy waggons, take two heavy boards about 2 ft. long; place one board at the front of the wheel, one end on the ground, and the other board under one of the spokes close up to the felloe. Take hold of a spoke on the opposite side of the wheel, and lift, and at the same time place the second board under the axletree.

WHIPPLE-TREE. Make the whipple-tree from split ash or oak from 30 to 34 in. long. If a staple be put through the centre, make from $1\frac{3}{4}$ in. square wood, but if a clasp iron or similar iron is used, $1\frac{1}{2}$ in. square will be sufficient. Lay the stick on one side, and mark off lines to each end, so that it will only be 1 in. broad at each end. Now plane off down to these lines; then plane the corners off till it is octagonal, and then round off oval with a spoke-shave and file. The stick should then be $1\frac{1}{2}$ in. diameter at the centre, and $1\frac{1}{2}$ in. × 1 in. oval at the two ends.

WILLOWS: TO KILL. When the bark peels freely, cut it round the trees about 4 ft. from the ground, and strip it downwards, leaving it attached to the tree. Elms and other trees may be treated in a similar manner.

WINDOWS: HOW TO HOLD UP. Bore three or four holes in each sash, and insert bottle corks, letting them project about $\frac{1}{16}$ in. These will press against the window frame by their own elasticity, and prevent any slip.

WINDOWS: TO PAINT. Give the frame two coats of white-lead paint before the glass is put in, even to those sold as "primed sashes". This will give a strong hold for the putty.

WINDOWS: RATTLING. Examine to find exactly where the window is loose. The jamb may be moved in most cases. If, however, this would mean too much disfigurement, make some small side buttons, and put them on each side of the jamb. These buttons should be so adjusted that they may be turned with considerable pressure against the sash. Instead of buttons, a small wedge may be inserted between the sash and jamb.

WIND-WHEEL. Cut two sticks 10 in. long from 1-in. square deal; halve them together at right angles, so that there are four arms each $4\frac{1}{2}$ in. long. Hold it so that an arm is upright, and mark the left-hand corner of the top arm, and the right-hand corner of the bottom arm; now turn it a quarter of a revolution and mark the two remaining arms as before. Chamfer each arm, working off the edge marked. Join the two sticks together, and drill a small hole through the centre. The stick to which the wheel is attached should have a vertical fan or vane fitted at one end; the other end should be rounded. Now drive a french nail through the hole in the wheel and into the rounded end of the stick. The wheel should rotate easily on this nail. If one arm has a tendency always to be at the bottom, cut it away a little, till the wheel is balanced. A tin washer may be put on the front to prevent the nail head wearing into the wood. After the wheel is set, get the balancing-point on the stick between the wheel and the vane, and bore a hole. Drive a nail through this hole into a vertical centre post, which should be rounded a little at the top; file off the head of the nail, and drop on the shaft.

WIRE: TO STRAIGHTEN. Drive hard wooden or iron pegs into a board almost in line, but slightly zigzag. Insert the wire between these pegs, so that it is almost straight, but it also is bent zigzag slightly in the opposite direction; then pull the wire through. If the wire be fine, pull it over a round wooden handle. If it be heavier but soft, it may be straightened by pulling it through the pins or by rolling between two hard boards.

WOOD: TO FELL. If the tree be felled before its prime, it contains a great deal of soft sap-wood; if it be felled at its prime, it contains its maximum amount of duramen or heart; but after its prime has passed, the duramen begins to rot in the centre. When the growth of leaves at the top begins to grow less, the tree is just at, or passing its prime. The bark is sometimes removed about six months before the tree is felled, and it is claimed that wood treated in this manner requires less seasoning. It is best to fell the trees in mid-summer or mid-winter—preferably mid-winter. If the tree be felled in mid-summer, let the leaves remain on the tree till they have sucked up as much sap as they will.

WOOD: GRAINLESS. (1) Glue wood shavings in layers, the

grain of any one layer being at right angles to the grain of the layers above and below; then roll thoroughly with a rolling-pin, and leave to dry under pressure. A board thus formed is as strong as wood, will not split or warp, can be used as papier-maché, and is also useful for complicated turnings, etc. (2) A very smooth surface may be made by mixing paper or parchment pulp, fret sawdust and glue to a thick putty. Leave it to dry under pressure. A cast of anything may be taken with this pulp if the article be first coated with tallow, then paper, and then the pulp applied. In this way small canoes are readily made from existing boats. (3) Dry lime-wood sawdust in front of a fire; grind it to a powder, and sift it through cambric. Boil 1 part gum-tragacanth, 1 part gum-arabic and 6 parts parchment size in water, and filter it through linen. Stir in the powdered wood, and work together, adding the wood gradually till the mass is like thick putty or pastry. Then stir in a little scent and the required colouring matter. Place the wood pulp in a glazed crock in sand, and heat gently, stirring all the time, and when very thick cast it in mould, or dry under pressure. 20 parts water to 1 part glue or linseed oil varnish may be substituted for the gum and size. This pulp when dry has the consistency of ivory, and is specially suitable for casting fancy articles.

WOOD: TO HARDEN. Boil the wood if small for 8 to 10 mins. in olive oil, and then let it stand in a warm place for a few days before using.

WOOD: TO PRESERVE. (1) Dry the wood, then place it in a barrel containing a solution of 1 part copper sulphate in 10 parts water. Leave it there for several days, then take it out, and dry, then immerse in creosote. Take it out again, dry, and immerse a second time in the creosote. The commercial method of creosoting wood is to immerse the dried wood in creosote under a pressure of 150 to 200 lb. per sq. in. (2) Pile the planks in a tank, put over all a layer of quicklime, and gradually slake with water. The timber requires from 1 to 8 days to become impregnated, depending on its quality and thickness.

WOOD: HOW TO SEASON. Boards should be stacked immediately they are sawn. If they be left only for a day or two on the ground before being stacked, they may be very seriously damaged. Place 3 in. square pieces of scantling parallel to each other on the ground about 6 ft. apart, and place the freshly-sawn boards on the top of, and at right angles to them. If the boards be 12 ft. long, one scantling will support one row of ends, another scantling the middles, and the third scantling the other ends of the boards. The boards should be so arranged that there is a gap of 1 in. between the edges of those next to each other. After the first layer has been arranged, support a second layer on the top of the first in a similar way; a third layer is erected on the top of the second, and so on until all the boards have been stacked. This will insure a free circulation of air round each individual board, which is essential. The boards must be protected from the sun and rain by a light roof. To prevent the ends from splitting, saturate hydrochloric acid with lime, and apply it like wash to the ends. After a few months the boards should be pulled down and restacked. It is best to replace the boards, and turn each one over individually, so that the sides which were uppermost are restacked at the bottom. The boards should be

left to season for from two to six years, but the longer they are left the better; timber used for very fine work is often seasoned for twenty years and upwards. Some woods often shrink every time the surface is planed off. Such timber should be planed, and then exposed to the sun and wind for about a fortnight. If the wood be required for use in two or three years, the planks may be stacked vertically, the top ends being the ends which were highest when the tree was growing. Wood thus treated will shrink a little, but not much. If a tree be cut down in mid-summer, and the leaves left on till they fade, and then sawn up into planks, it will not require quite so long to season. Non-resinous woods may be seasoned for almost immediate use by boiling them in water for a few hours, and then exposing them to the atmosphere, shaded from the sun and rain, for a few weeks. The method is not, however, so good as stacking. No wood can be absolutely guaranteed not to shrink after being made up, but the safest plan is to stack for a number of years. To season wood in logs, stack with good air circulation, and sheltered from direct sun and rain, as for boards. Logs containing a lot of sap should be quartered soon after they are cut, or they will crack. To quarter, first split them down the middle, and then split the halves in half again. Logs of resinous wood, or logs containing a medium amount of sap, should be squared immediately the tree is felled. To square, cut the bark and outer wood off till the log is approximately four sided.

WOOD: TO SELECT. The best and strongest wood is that which has its rings close together, and of a uniform width, and which also has long and well-marked rays. A board cut radially from a log with the rings across it at right angles is best, for it is not so liable to warp. Resinous wood should have little resin in the pores; non-resinous woods little sap. On sawing, the wood should have a firm surface, and the saw should run easily without the teeth getting clogged. Logs should be free from all shakes, bruises and deformations. If the wood be spongy near the middle, the tree has passed its prime, and has begun to decay. If a log be split straight down, it does not matter much; but if it be split spirally, a great deal of wood will be wasted in sawing up. The strongest part of a good log is the centre portion, known as *duramen*, the wood nearer the bark as *alburnum* or sap-wood. A maximum amount of duramen should be obtained with good wood. If the log be struck at one end, and the ear held at the other, the sound should be sharp and almost metallic—not dead. The following are terms by which timber of different sizes is technically known:—

Plank = Sawn timber 11 in. or more × 2 to 4 in. thick.

Deal = Sawn timber 9 to 11 in. × 2 to 4 in.

Board = 7 to 11 in. × under 2 in.

Quartering = Sawn timber 3 to 4 in. × 2 to 3 in.

Batten = Sawn timber under 7 in. × under 2 in.

WOOD: HOW TO SPLIT. If logs are to be split for firewood, set them up so that the top end is

the end which was uppermost in growing. Work from the outside to the centre, splitting off slabs. The slabs may be readily split up

into sticks by holding them in a crotch stick, or by two logs staked to the ground 6 to 8 in. apart, as shown in the illustration. Logs split easier when green than when partially seasoned. To prevent wood splitting, place it in paraffin wax in a water bath, and boil it until all bubbles cease to rise from the wood. The whole is then allowed to cool to about 120° Fahr., when the wooden article is taken out, and the superfluous paraffin wax removed with a coarse cloth. (*See also* WOOD (HOW TO SEASON)]

WOOD: HOW TO STEAM. Wood naturally tough, such as oak, ash or hickory is best. Use only the best split, not sawn, wood free from knots, and dress it down to nearly the required size. If the articles be small, leave them to soak in boiling water till soft enough. Larger pieces of wood may be buried in a box of sawdust, and boiling water poured over them, and left for ½ hour. The box should be fairly air-tight, and placed in front of a fire. A steam box is nearly always used. This may be made from four 1½-in. red deal boards 6 to 8 ft. long × 10 to 12 in. wide. Nail all the boards together to form a tube, with white-lead paint between the joints. Nail one end in solid, and hinge the other end. Elevate this box on trestles; cut a hole 4 in. square in the bottom near the solid end, and fix in a square wooden tube, so that the bottom end of it extends down into a tight wooden cover of a common stove pot or kettle. The kettle may be raised on stones till the cover fits tightly. Another way is to solder a piece of lead tube into the lid of the kettle, and fit the other end of the tube tightly through the bottom of the box. This is good because the tube is comparatively flexible. By boiling water in the kettle the box will be filled with steam, which will escape at the hinged end. A cork should be fitted into the spout of the kettle for a safety-valve. As a rule a stick 2 in. square will require ½ hr. steaming. Brittle wood requires longer steaming than wood naturally tough and flexible. To make the template to bend the wood upon, shape a piece of, say, 2 in. plank to the shape

the concave side of the article is to be. About 2 in. from the template bore a line of 1-in. holes about 6 in. apart where the curve is sharp. Make a set of hard wood pins to drive in these holes, and then a corresponding set of wedges. A piece of iron hoop may be used on the convex side of the wood to be bent, to prevent the grain of the timber giving way. If the hoop be long enough to reach the whole length, the iron may be bent over the ends of the stick, and tacked there. If the iron only reaches over the part to be bent, drill a hole through the iron at one end, and fasten it to the stick with a short screw, so that the ends of the wood and the iron are even. The iron should be attached to the stick before it is placed in the steam box. When the stick is sufficiently steamed, take it from the box, place the end between a pin and the template, drive in a wedge to make it firm, and then bend evenly and quickly, putting in pins and driving in wedges as required. Let the wood lie pressed against the template till thoroughly dry; if it be taken out before it is dry, it will spring.

WOOD: VARIETIES OF. *Ash:* Sp. Gr. = ·75. Hard, tough

and durable. Used for wheels, tools, etc., and is very suitable for steaming and bending. That which has grown on rich, marshy lands is considered the best.

Beech: Sp. Gr. = ·75. Hard and well marked. Used for barrels, tools, domestic articles and cabinet work.

Ebony: Sp. Gr. = 1·2. Very hard and brittle. Used for furniture and ornamental inlaying.

Elm: Sp. Gr. = ·53. Very coarse grained and liable to warp. Is hardened by immersion in water. Used for piles, coffins and agricultural implements, but is not suitable for outdoor sheds, etc.

Greenheart: Sp. Gr. = 1·1. Very hard and elastic. Is hardened by immersion in water. Used for piles, coach-building, fishing-rods, etc.

Hickory: Sp. Gr. = 1·0. Hard and elastic. Used for barrels, coach-building, fishing-rods, etc.

Holly: Sp. Gr. = ·76. Very hard and tough. Used for ornamental inlaying and work generally, turnery, etc.

Larch: Sp. Gr. = ·6. Light and strong. Is toughened by exposure to the atmosphere, and hardened by immersion in water. Used for floorings, boats, etc.

Lignum Vitæ: Sp. Gr. = 1·25. Hard and oily. Used for bearings.

Mahogany: Sp. Gr. = ·6 to ·9. Very variable. The Spanish variety is better marked but rather brittle. Used for best joinery and cabinet work. This wood becomes darker by exposure to sunlight, or by being kept in a living-room.

Oak: Sp. Gr. = ·75 to ·95. English oak is heavier and harder and better marked than the American variety. English oak is used for agricultural implements, joists and building generally. American oak is used for ship-building. The rings should be close, thick and uniform; the wood should have a glossy varnish-like appearance when cut, and should be of a straw colour. Oak becomes lighter by exposure to sunlight, but darker by being kept in a living room.

Pine: "Yellow-pine": Sp. Gr. = ·5. Not very strong, but free from knots. Is destroyed by immersion in water, and becomes brittle by exposure to the atmosphere. Yellow-pine from St. Petersburg is considered the best. The body colour should be light yellow, and the rings an opaque brown. It should have no smell. *Pitch-pine:* Sp. Gr. = ·65 is very tough, resinous and durable. Used almost universally where it can be kept dry or painted. The yellow body colour should be bright, and the redder the rings the better. The rings should also appear translucent, and smell resinous.

Rosewood: Sp. Gr. = 1·2. Tough and close grained. Used for best cabinet work and furniture generally.

Teak: Sp. Gr. = ·75. Tough and very durable. Is hardened by immersion in water. Used for ship-building.

Walnut: Sp. Gr. = ·65. Hard and finely marked. Used for best cabinet work and furniture generally. This wood becomes lighter by exposure to sunlight, but darker by being kept in a living-room.

Yew: Sp. Gr. = ·8. Very tough and elastic. Used for furniture, bows, arrows, etc.

WOOD: WARPED. If a fairly thin piece of wood be warped, moisten the concave side with a damp sponge till it flattens out. Then glue very thin shavings from some tough wood across the grain on the back. One layer of shavings will often be found sufficient. Parchment may be substituted for the shavings, but it should be glued on in strips, not in one piece.

WOOD: WORM-EATEN. Dissolve 2 drs. corrosive sublimate in 2 oz. methylated spirits and 2 oz. water, and apply with a brush. Then make up a "filler" from sawdust of the same wood and glue, and fill up all the holes.

WOOLLENS: HOW TO CLEAN. Mix salt and warm soft water in a tub to a weak brine; then add 1 gal. warm lye and enough soda to make good suds when stirred. Put in as much wool as the vessel will hold, and leave over night; then wash out, and rinse in cold water. [*See also* BLANKETS (HOW TO CLEAN), and FLANNEL (HOW TO CLEAN)]

APPENDIX.

DRILLING METALS to the novice is frequently an arduous task, and to lighten it the following method is given to enable holes to be drilled accurately and expeditiously with some reduction of labour.

Turn a piece of steel to the diameter required, less $\frac{1}{1000}$ of an inch of the size of the hole to be made; then file away two sides until the thickness is about one-fourth the diameter, commencing below the part that forms the shank. Bevel the point in the usual way and back off the edges to form cutting angles; then make a hollow on the cutting face until the edges are keen. After hardening grind the point from both sides until it is about the size of the point of a small drill.

This drill will cut quickly, and as fast as a first-class twist drill; but the twist drill, forced through at a fast speed, will leave the hole as if it had been threaded, whereas the drill made as described will work equally as fast, but the hole will be as if it had been rosebitted. With the drill metals can easily be pierced with holes.

HYDRAULIC RAMS are used as pumping engines, and are generally installed away from where expert assistance can be obtained; therefore it is a good thing to know how to remedy an evil when it occurs without having to await the coming of an expert.

When failure occurs the first thing is to see that the valve seats are free from a leaf or dirt. If these are clean see that the valves seat themselves properly, because faulty valve faces are frequently the cause of serious trouble.

Keep the region of the ram free from leaves and detritus, which are brought down by the flowing water.

The valves should be ground on by the ordinary process.

Periodical cleaning and an examination of the valve faces will well repay the trouble expended. The valves should not be loaded because the ram action is due to the rebound of water against the dash valve, and water is pumped by first compressing the air; then the rebound acts as the force to raise the water.

Thus, it is seen that well-fitting valve faces are necessary, and a clean ram chamber.

HYDRAULIC PRESS LEATHERS. The U leather is generally used, and a good plan is to fill the U with fine flax which has been soaked in boiling tallow. Occasional attention is necessary because the packing is inclined to harden under water contact. Take out the flax packing and separate the fibres, and after cleansing it apply the boiled tallow.

If this is attended to properly, much loss of power will be prevented, and this means a saving in time and money.

Such packing must be loose enough to allow the ram to fall by its own weight within the cylinder.

LESSENING THE NOISE CAUSED BY RUNNING MACHINERY. Noise is due to vibration, but there may be vibration without noise, and where vibration occasions noise it can be prevented from being a nuisance. To prevent noise being carried from one building to another dig out a trench on the side of the wall on which the machinery is situated deep enough to uncover the foundations for a distance of about 1 foot from the wall.

Fill in the trench with dry sand in which are imbedded the uprights of a wooden frame. The frame may be made of $1\frac{1}{2}$ by 6 inch floor boards placed edgewise to the wall face and standing an inch or two away from the wall, the top ends being secured to wooden studs driven into the wall. The outer face of the frame must be sheeted with thin matchwood, and as each width is added the space between the wall and the wood must be filled with dry sawdust right up to the top of the framework, but the frame must not be secured to the floor above.

This plan is effectual, and will be successful even if printing machinery, engaged on newspaper work, is the cause of the noise, and on the other side of the wall there may be a platform of a public hall.

The vibrations are not destroyed, but they are distributed amongst so many particles of matter that the noise is practically eliminated.

MOTOR CYCLES. Frequently a motor-cycle or motor-car will fail to work well, and a common cause of failure is over-oiling. When an engine that has worked well hitherto becomes erratic in its movement probably over-oiling or a dirty cylinder is the cause.

If a motor-cycle, place it on its stand, then open the bottom drain-cock and after disconnecting the firing terminals, pedal strongly until the dirty oil has been pumped out. Now pour some petrol into the grease-tap and pedal again, and do so until the discharge from the drain-cock is nearly clean petrol. Connect up the terminals, and re-oil, and more often than enough the engine will run well and strongly.

If the engine still works erratically examine the batteries to see that they are not exhausted, and also the terminals to see that they are sound. The sparking plug should be clean after the operation of cleaning out the cylinder.

Frequently the cause is due to short circuiting between the contact plates of the commutator, and the cause is metal particles that are worn off and span the gap. When this is the case wash out the commutator with petrol and clear away the ragged parts on the edges of the contact plates.

A large commutator may be more expensive than a smaller one, but the extra expense is easily covered by less liability to short circuit.

The contact points of all electric or magneto connections must be kept clean and free from loose particles that will cause short circuits.

Firing-Moment: The correct position for the firing moment is when the piston is within an $\frac{1}{8}$ of the complete inward stroke. When this is correct the regulating lever should be about midway of its limit movement. This will allow the sparking to be advanced or retarded according to the number of revolutions made by the engine.

If all these things are correct and the engine shows a loss of power the inlet and exhaust valves should be examined. A simple test to

prove whether the seats are correct or not is to wipe the faces; then draw a piece of chalk across the face, when a few turns will prove its accuracy. If accurate the chalk mark will be carried around the entire circle of the face, and by repeating the operation the other face can be tested as easily.

If the faces are not in good contact, some grinding material and a few circular turns of the valve will likely bring the faces together.

Should all these attentions fail the piston rings may be at fault, and this can be corrected to enable the machine to be got home without further delay, when new rings can be inserted.

Loss of power due to faulty and bad-fitting rings may be remedied temporarily by placing the surface of the outside of the ring on a hard, bright or smooth surface; then carefully go over the inside of the ring with the small ball face of a hammer or its pean if so provided. This must be done carefully and slowly, when the consecutive hammering will expand the ring so that when it is replaced it will fill the cylinder. The joints will be wider apart, but the engine will be able to work with sufficient power to make even a long run.

New rings should be fitted at the earliest moment to avoid loss of power past the open ends of the rings.

Even this may not make matters right, but it will show that the fault rests with the mixture.

The Mixture: Petrol or spirit vaporised is one ingredient in the power factor, but unless a correct mixture of air and vaporised spirit is obtained the engine cannot work properly.

Weather conditions affects the value of the air supply with the result of altering the mixture.

In cold dry weather, or in dry summer weather the air volume is light in unit weight, necessitating a larger volume to allow for loss of unit weight. In heavy, muggy weather a less volume is needed for an equal weight. Experience is the best test for quality of mixture, and the driver should be alive to the necessity of altering the volume of air admitted to suit conditions.

One supply of petrol is the best for all occasions and for all speeds, in fact it is invariable within limits, therefore air regulation is important.

When an engine is revolving slowly the petrol is sucked up similar to a string of beads, therefore less air is required than when the engine is revolving fast; when the petrol is sucked up as a continuous stream, as a solid cord, more air is needed.

Generally an experienced driver knows by intuition the quantity of air required for different speeds of engine, so he naturally tries to produce a good mixture.

Variation of the air supply occurs under normal weather conditions, as an open road means a light air volume per unit weight, whereas under the cover of trees the atmosphere is heavy, and a less volume of air for the unit weight must be arranged for.

The proportions between air volume and liquid petrol volume are very wide apart; therefore the relatively small volume of petrol is difficult to control, whereas the much larger volume of the air used can be controlled effectively.

This indicates the wisdom of controlling the manufacture of mixture suited to conditions, which can be accomplished most economically by the air control.

It is only necessary to point out that the experience of motor drivers is that an engine runs better under night conditions than under those of the day, and the cause is the denser atmospheric conditions of the night air.

The petrol volume in the liquid state is exceedingly small per pound weight, whereas the air volume is infinitely large, therefore it is economical to control the larger volume, besides it is easier to accomplish than the control of an exceedingly small volume. Thus, regulating the speed of an engine by controlling the air supply is economically wise.

Belts: It saves power, mitigates annoyance, and adds to the speed of a motor-cycle, when belt driven, if the belt is regularly taken off the machine, thoroughly scraped, and washed with hot water and soap; then, when dry, several coats of castor oil should be applied and allowed to dry.

This will leave the belt supple; yet it will drive well even when the belt is slack enough to be pushed together with the finger to about $\frac{3}{4}$ of the normal distance apart.

Even heavy driving belts, so treated, will give good results and well repay the trouble and time employed in cleansing them. The same reasoning applies to leather faced clutches, or brake bands; they last longer, are more reliable, hold better by keeping them clean and the leather supple.

Chains: Chains should be run as slack as possible, in fact slack enough just short of riding over the teeth of the sprocket. They should be taken off at least once a week when in continuous use, then boiled, and after being allowed to dry, carefully oil all the joints. This will increase the life of the chain and add to its driving power, by eliminating friction due to dirt.

Silencer: A noisy silencer means either a bad mixture or a poor piston, and such noise always spells waste power. No explosion can occur if there is nothing to explode. Excess of petrol or lack of it is productive of noise, which is avoidable by attention.

A bad mixture causes misfires and they mean noise and lost power. If a silencer is of ample size the explosive mixture discharged from the cylinder need be of little nuisance; but an explosive mixture that includes crude petrol will explode in the silencer and cause excessive noise. When riding against a wind misfires will probably occur, but they may be mitigated by cutting down the air supply. Generally a noisy silencer indicates an inexperienced driver, and always a waste of power.

Tyres: A loose flabby tyre is always a cause of trouble, and the looser it is the greater is the surface exposed to the ground to act as a sucker to be overcome as the wheels revolve. A loose tyre means a smaller wheel radius and more revolutions to attain a given speed; thus a hard tyre saves power and prevents slip when the roads are greasy, because less surface is exposed to the road. On many stretches of road greasy surface is struck, as under the shadow of trees where the roadway is laid with limestone. Hard tyres are best under all conditions and wear out less rapidly than when allowed to run flabby. On greasy roads hard tyres mean less side-slip and better speed on a lower power.

Brakes: All surfaces must be kept clean, and all connections should be substantial with a very high factor of safety. When wire connections are used frequent examination is necessary to prevent mishaps that may be serious, because the alternate bending and straightening of a wire soon destroys the strands. The brake should be strong enough to hold its own against the full power of the engine, and this is usually the footbrake. It is considered to be bad practice to use the foot lever of the clutch to regulate the speed in traffic; it may be bad practice, but, like the speed gears in general

use that are considered an abortion of mechanical action, they are hard to beat; so regulating the speed by the clutch may be bad, but it is effectual and easy; for this reason such clutch gear should be of ample strength and retained in a high state of efficiency.

Differential: This should be kept clean, as all working parts of a motor-cycle or car; but some restraint should be imposed upon too free an action which contributes to side-slip. The idea that the differential is largely contributory to side-slip is gaining ground. It is quite easy to prove that the idea is correct; therefore restraining its too free action is a safeguard against excessive side-slip, which is an actual danger.

Petrol-storage: Petrol tanks should be cleaned out frequently, because carelessness in this direction contributes to a bad mixture with its attendant evils. The dirt is usually of an attrititive character that acts as a scouring medium when admitted to the cylinder, and this means a reduced life for the apparatus.

Oiling: Too much oil is as bad as too little, because both extremes lead to eventual stoppage. No oil produces the result more rapidly than too much, but the eventual end is the same stoppage—loss of time and waste of money. Oiling regularly and consistently is the saving clause in all motor operations.

Head-lights: These are intended to show the driver the road before him, and not for the purpose of blinding other drivers or annoying pedestrians. When the greatest length of the beams of light are concentred on the road before the car the best is reached, and annoyance to others is reduced to the utmost limit.

Regulate the light by adjusting the lamp bracket, so that the beam of light is projected on to the road, well in front of the car.

As a general statement, it is wise to "Let well alone". The meaning is that many make experiments that are best left alone. Before anything is touched a clear reason must be given before doing it.

Serious matters are best left to the expert, but it is a good thing when the driver knows why an expert does things.

It is the cheapest plan to keep every working part clean, and the veriest novice can do that.

Gas and Oil Engines: What has been said of the motor-car engine equally applies to both gas and oil motors with one exception, the oil engine requires a vaporiser, which probably cannot be made or mended by the novice; but it can be kept clean and free from carbon deposit. Temperature is the important factor, and where this is attended to both time and expense are saved, and power is fully utilised. Regulating the air supply is necessary both for gas and oil engines, and weather conditions must be studied.

The various points indicated in regard to the motor-engine are equally important, and keeping valves, pistons, and mixture right aids the end in view—the use of power that pays.

REGILDING PICTURE AND OTHER FRAMES. When a frame requires regilding use bronze powder and terribene mixed; about a sixpenny packet of gold-bronze powder and twopenny worth of terribene will be sufficient for about 6 square feet of surface.

After cleaning the surface, apply the mixture with a camel-hair brush, and after it is dry cover with one coat of light-coloured varnish.

The new coat will look well and last a long time, and be equal to the more costly gilding process.

TO REMOVE RUST. When tubes are coated with oxide of rust it can be removed by frequent applications of paraffin,which must be allowed to dry, when the oxide can be brushed off with wire brushes. If pitting has not occurred, a coat of black will restore the surface to its original newness.

SOFTENING HARD WATER. Fill a wicker basket with unslaked lime and place it about a foot below the surface of the water retained in a tank. If water is drawn off from above the basket the water will be found to have lost its hardness, where excess of lime is the cause.

Water that is hard by matter in solution requires different treatment, but, generally, hard water is due to lime in solution, when the extra lime precipitates the lime in the water, bringing it down as a sediment, which requires removing as required.

Very little experience will give the period during which the added lime is effective. As a test, if the water taken from above the basket will lather freely under a soap test, it is soft; if not, it is hard, and fresh lime is needed.

SOLDERING CAST IRON. As an expedient of a temporary character this is accomplished by subjecting the clean and newly fractured surfaces to friction with a piece of soft brass until the whole surface presents a brassy appearance, then it is tinned in the usual way, and it can be soldered easily.

Sometimes part of a casting on a motor-car breaks which cannot be replaced; therefore being able to solder it becomes a saving factor to avoid serious detention.

The repair is only temporary, but it is effective, though a new part must replace the fractured article at the earliest possible moment, that is when it can be obtained.

ALTERNATIVE NAMES OF MATERIALS MENTIONED IN THE BOOK.

Ammonium chloride = Sal-ammoniac.
Aqua fortis = Nitric acid.
Barium sulphate = Permanent white.
Bleaching powder = Chloride of lime (commercial); or Hypochlorite of lime.
Blue copperas = Copper sulphate.
Blue vitriol = Copper sulphate; or Cupric sulphate.
Boot powder = French chalk.
Calcium carbonate = Whiting.
Calcium fluoride = Fluor spar.
Calcium sulphate = Gypsum.
Canada balsam = Fir balsam.
Caoutchouc = India-rubber.
Caustic potash (solution) = Liquor potassæ.
Chlorhydric acid = Hydrochloric acid; or Muriatic acid; or Spirits of salts.
Chloride of lime (commercial) = Bleaching powder.
Citric acid = Salts of lemon.
Colophonium = Resin.
Copper sulphate = Blue copperas; or Blue vitriol; or Cupric sulphate.
Corrosive sublimate = Protochloride of mercury; or Bichloride of mercury.
Cupric sulphate = Copper sulphate; or Blue vitriol; or Blue copperas.
Ferrous sulphate = Green copperas.
Fir balsam = Canada balsam.
Fish glue = Sturgeon's bladder.
Fluor spar = Calcium fluoride.
French chalk = Boot powder.
Green copperas = Sulphate of iron.
Gum thus = Venice turpentine.
Gypsum = Sulphate of calcium.
Hartshorn = Solution of ammonia.
Hydrochloric acid = Muriatic acid; or Spirits of salt; or Chlorhydric acid.
India-rubber = Caoutchouc.
Iron sulphate = Ferrous sulphate; or Green copperas.
Killed acid = Zinc chloride; or Killed spirits.
Killed spirits = Zinc chloride; or Killed acid.
Lime hypochlorite = Bleaching powder; or Chloride of lime.
Liquor potassæ = Caustic potash (solution).
Mercuric bichloride = Corrosive sublimate.
Mercuric protochloride = Corrosive sublimate.
Muriatic acid = Hydrochloric acid; or Spirits of salts.
Nitrate of potash = Saltpetre.
Nitric acid = Aqua fortis.
Pearlash = Salts of tartar.
Permanent white = Barium sulphate.
Plaster of Paris = Calcic sulphate.
Potash = Potassa.
Potassa = Potash.
Putty powder = Tin oxide; or Stannous oxide.
Resin = Colophonium.
Sal-ammoniac = Ammonium chloride.
Sal-soda = Washing soda.
Salt = Sodium chloride.
Saltpetre = Nitrate of potash.
Salts of lemon = Citric acid.
Salts of tartar = Pearlash.
Silicate of soda = Water-glass.
Sodium chloride = Salt.
Spirits of salts = Hydrochloric acid; or Muriatic acid.
Stannous oxide = Putty powder; or Tin oxide.
Sturgeon's bladder = Fish glue.
Tin oxide = Putty powder; or Stannous oxide.
Venice turpentine = Gum thus.
Water-glass = Silicate of soda.
White copperas = Zinc sulphate; or White vitriol.
White vitriol = Zinc sulphate; or White copperas.
Whiting = Calcium carbonate.
Zinc chloride = Killed spirits; or Killed acid.
Zinc sulphate = White copperas; or White vitriol.

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